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MARCH 26, 1945

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CANDIDATES FOR SECOND AWARD OF THE OLNEY MEDAL

The Olney Medal is to be awarded for outstanding achievement in the field of textile chemistry, which is understood to include the development of chemical agents or chemical processes used in the manufacture of textiles or methods for their evaluation. In making awards, the Committee need not be confined to the consideration of any one specific achievement or contribution, but may in its discretion consider the sum total of various and continued contributions to the field, no matter of how long duration. Any citizen of the United States of America, whether male or female, may be the recipient of the award.

Any Senior member of the American Association of Textile Chemists and Colorists may nominate a candidate for receipt of the award by letter addressed to the Olney Medal Committee of Award, care of the Secretary, Box 28, Lowell, Mass. This letter shall set forth in detail all facts which qualify the candidate for consideration, with particular reference to published works and professional qualifications.

It is requested that five copies of each letter be submitted, or single copy on one sheet suitable for photographic reproduction and distribution to the five voting members of the Committee of Award.

CALENDAR OF COMING EVENTS

Meeting, Philadelphia Section, Hotel Philadelphian, Philadelphia, Pa., April 20, 1945. Symposium on "Test Methods for Grading Light Fastness." Speakers: Capt. Stanley Backer, Philadelphia Quartermaster Depot, "Some Aspects of the Variability of Weathering Tests"; Dr. Herbert F. Launer, National Bureau of Standards, "The Standard Fading Lamp at the National Bureau of Standards and Means for Calibrating Other Lamps in Terms of It"; Charles A. Seibert, E. I. duPont de Nemours & Co., Inc., "A Proposed Method for the Calibration of Fading Lamps."

Meeting, New York Section, Downtown Athletic Club, New York City, May 18, 1945. Symposium on "Corrolation of Test Methods with Consumer End Uses." Annual Business Meeting.

Meeting, Northern New England Section, May 25, 1945.

OTHER ASSOCIATION MEETINGS

Meeting, Amer. Assn. of Textile Technologists, Builders' Club, New York City April 4, 1945. Medal Meeting, Am. Inst. of Chemists, Columbus, Ohio, May 11, 1945.

Report on A.A.T.C.C. Cooperative Tests for Determining MILDEW-AND ROT-RESISTANCE

November, 1943—July, 1944

Prepared by the SUB-COMMITTEE ON MILDEW PROOFING[1]

IN ACCORDANCE with the program adopted at the April 1943 meeting of the AATCC Sub-Committee on Mildew Proofing, 15 sets of treated fabric samples and the directions for testing procedures[2] were prepared and distributed to the interested organizations in November of that year. It later developed that some of those who had requested samples were for various reasons unable to carry out the testing work, but by July of 1944 reports covering one or more tests had been received from twelve different laboratories. The following summarized review of this cooperative work was prepared for the information of the participating organizations.

In addition to instructions for preparing specimens, etc., the "Outline of Test Methods" described six microbiological tests. For convenience these methods are referred to in the accompanying tables by numbers, as follows:

Test No. 1.—*Chaetomium globosum*, direct inoculation - sterilized specimen method, (IIIA); Test No. 2—*Metarrhizium glutinosum*, preinoculation-unsterilized specimen method, (IIIB); Test No. 3—*Asperillus niger* (Nutrient salts-agar method), (IIIC1); Test No. 4—*Aspergillus niger* (Malt extract-Partansky method), (IIIC2); Test No. 4a—*Chaetomium globosum* (Malt extract-Partansky method), (IIIC2); Test No. 5—Soil Burial, (IVA); Test No. 6—Soil Suspension, (IVB).

[1] This report is compiled from the data furnished by the following members, or cooperating nonmembers, and laboratories participating in these tests:

1. H. D. Barker and P. B. Marsh, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture.
2. C. H. Bayley and A. S. Tweedie, National Research Council of Canada.
3. Elmer C. Bertolet, Jeffersonville Quartermaster Depot.
4. J. Robert Bonnar, General Dyestuff Corporation.
5. J. D. Dean, Southern Regional Laboratory, Bureau of Agricultural and Industrial Chemistry, U. S. Department of Agriculture.
6. Margaret S. Furry, Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture.
7. J. E. Goodavage, Philadelphia Quartermaster Depot.
8. O. B. Hager, Rohm & Haas Company.
9. F. J. Meyer, Dow Chemical Company.
10. R. F. Tener and E. Abrams, National Bureau of Standards.
11. W. H. Tisdale and N. E. Borlaug, E. I. du Pont de Nemours Company.
12. Francis Tripp, New Bedford Textile School.

[2] The outline of test methods used is presented in the second section of this report.

THE TREATED FABRIC SAMPLES

To minimize variability in the preparation of the samples, a special sub-committee[3] was requested to secure a sufficient yardage of a uniform quality light fabric and to have each of the experimental treatments applied at one laboratory. A quantity of scoured and direct-dyed 48x48 5-ounce cotton sheeting was furnished by the Philadelphia Quartermaster Depot. Three commercial fabric fungicides representing different commercial groups of compounds were selected for this work. Portions of the fabric were treated at the Southern Regional Research Laboratory with each compound in what was understood to be its recommended commercial concentration, and other portions treated with four successive reductions (½, ¼, ⅛, 1/16) of this original concentration, the resulting sample series thus representing five graduated dosages of each compound. Code numbers were assigned to the samples so prepared, and they were distributed without other identification. A small amount of untreated original fabric was included to serve as a control in the tests. The fungicides used were:

Treatment No. I.—Copper naphthenate, Solvent solution; Treatment No. II.—Dihydroxydichlorodiphenylmethane, Solvent solution; Treatment No. III.—Phenyl mercury triethanol ammonium lactate, Water solution.

Identification of treating agents and concentrations under the coded sample numbers is given in the tables following. In the case of copper naphthenate, the concentrations represent percent by weight of metallic copper on the fabric, as determined by chemical analysis. For the other treatments the concentrations refer to the theoretical amount of the compound on the fabric, as determined by wet and dry pick-ups. For convenience, the fungicides are subsequently referred to as Treatments I, II, and III, as listed above.

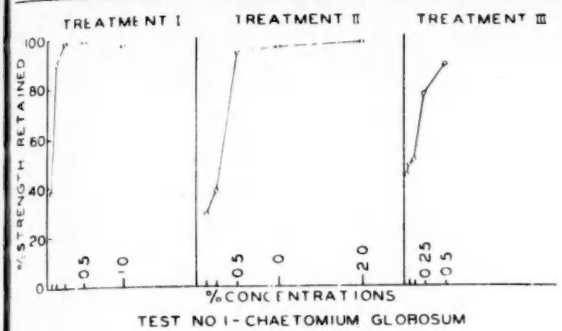
[3] Members of subcommittee on samples: J. D. Dean, chairman; R. D. Wells (formerly chairman); J. E. Goodavage; and O. B. Hager.

METHOD OF PRESENTING RESULTS

It is desired in this summary to present all results as nearly as possible on a comparable basis. It has accordingly been necessary to omit a few sets of reported values which were secured by methods other than those specified or used by the majority of investigators—for example, a six weeks soil burial test in a single laboratory. When results were reported for exposures of both leached and unleached specimens, those from the unleached specimens were used in recording soil burial test results and from the leached fabrics for all other tests. The per cent of original strength remained after exposure has been used throughout as the basis of comparison. All strength change figures represent the average value of five replicates in each determination. When breaking strengths of exposed specimens were reported in pounds, per cent strength change has been calculated on the basis of original breaking strength data given in the testing directive. Results of tests which involve strength change of fabric are shown both in detailed tables, in which the individual variations may be observed, and in graphs which are based upon the averaged results of all participants in each test. The laboratory designations (A, B, C, etc.) used in the tables have been retained unchanged in all cases. These designations have no relation to the order in which the laboratories are listed in footnote 1.

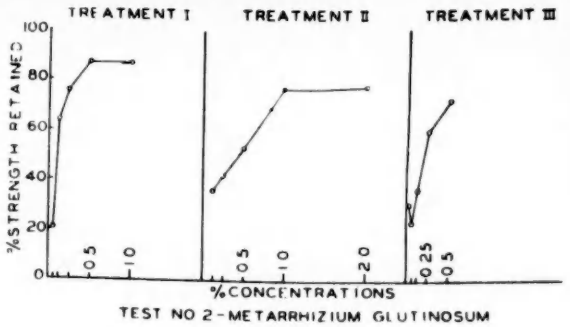
RESULTS OBTAINED

Rot resistance pure cuture tests included two active cellulose destroying fungi. These tests further differed in that Chaetomium was applied to sterile specimens by direct pipette inoculation whereas Metarrhizium had been previously introduced in the culture chamber and was a profuse mat of mycelia at the time the unsterilized specimens were introduced. Hence, in comparing the two methods any observed differences cannot on the basis of these data be attributed uniquely to organisms, sterilization, or type of inoculation.



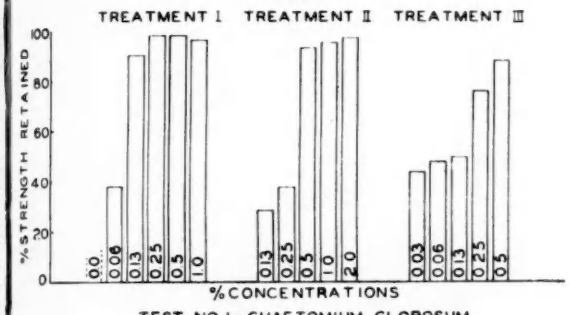
TEST NO 1 - CHAETOMIUM GLOBOSUM

FIGURE 1



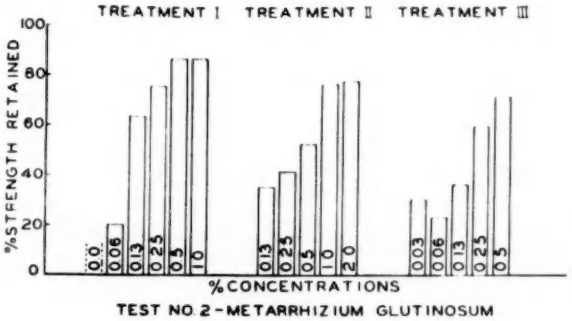
TEST NO 2 - METARRHIZIUM GLUTINOSUM

FIGURE 2



TEST NO 1 - CHAETOMIUM GLOBOSUM

FIGURE 3



TEST NO 2 - METARRHIZIUM GLUTINOSUM

FIGURE 4

Details of the Chaetomium Test (No. 1) as reported by eight laboratories appear in Table 1. It will be recalled that each individual value reported is the average of five replicates, so that the final mean value here represents forty specimens tested by diverse operators under varying conditions for each dose-treatment combination. The progressive doses for each treatment, moreover, serve as "controls" for each other so that the mean values for the eight laboratories and for the 3 treatments may be compared within each table. Thus in Table 1 each laboratory is represented by 75 comparable specimens and each treatment by 200 specimens. The comparability of the latter may be questioned on the basis that the doses for three types of treatments may have been incorrectly chosen. Table 2 presents the *Metarrhizium* Test (No. 2) results, also with eight participants. The mean values calculated from these two tests are presented graphically in Figure 1 for Test No. 1 (Chaetomium) and in Figure 2 for Test No. 2 *(Metarrhizium)*, in which per cent strength retained has been plotted against concentration of treating agents, and also in Figures 3 and 4, in which bar graphs have been employed.

Results of tests (Nos. 3, 4 and 4a) involving observation of growth on inoculated specimens are shown in Tables 3, 4 and 5. In these tables observations are recorded by a system of numerical values in which 1 indicates no growth, 2—slight growth, 3—medium growth, and 4—heavy growth. In one or two cases where a somewhat different numerical system was employed by the individual investigators, the results reported have been translated as closely as possible into the common scale values. Tables 3 and 4 represent tests with the superficial non-tendering mildew producing organism, Aspergillus niger, after 4 days incubation and 14 days incubation, respectively. An additional difference is that in test No. 3

TABLE 1

Test No. 1. Chaetomium globosum (III A)
(14 Days Incubation)

Sample Number	*Treatment (Concentration)*	*% STRENGTH RETAINED (Individual Laboratory Results)*								
		A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*Mean*
0	(Control)	..	..	46	0	16	2	3	8	13
I										
7	0.06% (Cu)	6	100	31	24	15	10	16	100	38
3	0.13% (Cu)	64	100	95	100	77	94	94	93	90
8	0.25% (Cu)	100	100	100	100	93	95	97	100	98
13	0.50% (Cu)	97	97	94	100	100	98	98	97	98
10	1.00% (Cu)	98	100	94	95	100	93	91	100	96
Mean (treatment-laboratory)		73	99	83	84	77	78	79	98	84
II										
14	0.13%	7	16	22	100	25	0	5	55	29
15	0.25%	18	19	33	98	24	0	11	99	38
5	0.50%	66	100	98	100	100	89	95	94	93
6	1.00%	80	100	100	97	100	98	92	93	95
4	2.00%	95	100	98	100	100	97	91	94	97
Mean (treatment-laboratory)		53	67	70	99	70	57	59	87	70
III										
1	0.03%	14	54	54	30	15	85	75	28	44
9	0.06%	17	75	57	64	17	88	47	18	48
12	0.13%	14	76	40	42	18	98	60	52	50
11	0.25%	22	100	93	98	47	100	100	50	76
2	0.50%	75	100	100	100	63	95	95	76	88
Mean (treatment-laboratory)		28	81	69	67	32	93	75	45	61
Combined treatments										
Dosage	1/16	9	57	36	31	18	32	32	61	37
Dosage	⅛	33	65	62	87	39	61	51	70	59
Dosage	¼	60	92	79	81	70	74	84	82	80
Dosage	½	66	99	96	98	82	99	97	80	90
Dosage	full	89	100	97	98	88	95	92	90	94
Mean (laboratory)		51	82	74	83	60	76	71	77	72

TABLE 2
Test No. 2. Metarrhizium glutinosum (III B)
(7 Days Incubation)

Sample Number	Treatment (Concentration)	% STRENGTH RETAINED (Individual Laboratory Results) A	B	C	D	E	F	G	H	Mean
0	(Control)	2	—	2	37	6	31	3	18	14
I										
7	0.06% (Cu)	15	21	11	72	16	17	3	13	21
3	0.13% (Cu)	30	65	42	95	100	60	73	47	64
8	0.25% (Cu)	45	80	75	100	85	55	73	91	76
13	0.50% (Cu)	82	83	80	98	100	79	76	97	87
10	1.00% (Cu)	83	84	89	89	100	84	69	98	87
Mean (treatment-laboratory)		51	67	59	91	80	59	59	69	67
II										
14	0.13%	39	17	71	85	23	25	8	20	36
15	0.25%	51	21	41	76	67	25	30	27	42
5	0.50%	34	44	55	70	100	39	59	24	53
6	1.00%	38	85	82	74	100	89	73	76	77
4	2.00%	67	80	75	78	100	78	72	70	78
Mean (treatment-laboratory)		46	49	65	77	78	51	48	43	57
III										
1	0.03%	11	23	33	55	9	49	7	61	31
9	0.06%	19	37	10	51	0	23	21	29	24
12	0.13%	21	35	70	75	2	29	10	51	37
11	0.25%	36	76	65	75	38	74	37	79	60
2	0.50%	31	73	67	91	100	80	41	90	72
Mean (treatment-laboratory)		24	49	49	69	30	51	23	62	45
Combined treatments										
Dosage	1/16	33	20	38	71	16	30	6	31	29
Dosage	1/8	33	41	31	74	56	36	41	34	43
Dosage	1/4	33	53	67	82	62	41	47	55	58
Dosage	1/2	52	82	76	82	79	81	62	84	75
Dosage	full	60	79	77	86	100	81	61	86	79
Mean (laboratory)		40	55	58	79	63	54	43	58	56

a half of one per cent glucose is added to the mineral-salts medium whereas in test No. 4 the only source of carbohydrates after the specimens are transferred to the mineral-salts agar is impurities on the specimens or those carried over by the mycelium. Table No. 5 may be compared with 3 and 4 in showing how visual growth of Aspergillus and Chaetomium compares for various treatments and dosages or with Table No. 1 for determining how well visual classification of results compares with evaluation by breaking strength determinations.

Detailed figures of the Soil Burial Test (No. 5) are given in Table 6. Ten laboratories reported results for one or more periods of soil contact, the highest number participating in any one test. The comparative resistances to soil exposure exhibited by the three fungicidal treatments are shown in Figure 5, in which the mean strength retentions from Table 6 for 7, 14 and 21 days exposure periods have been averaged and plotted against concentrations. In Figure 6, bar graphs show in more detail the performance of these treatments for contact periods of 14 and 21 days.

Results of the Soil Suspension Test (No. 6) in which three laboratories participated, are given in Table 7. In Figure 7 the Soil Suspension results after 14 days incubation are plotted in comparison with those of Soil Burial after 14 days exposure.

DISCUSSIONS AND CONCLUSION

The chief aim of this interlaboratory program was to secure a comparison of results obtained by several independent investigators applying the prescribed testing procedures to identically treated fabric samples. It is therefore of interest to observe the points of agreement and of divergence which appear in the compiled test results, and from them to arrive at some conclusions regarding the relative utility and dependability of these methods in evaluating fungicidal treatments.

In general, the tabulated data show that the greatest variations among individual laboratory results occur in the case of samples treated with the lower concentrations of fungicides. Such variations may be attributed both to the great difficulty of evaluating accurately relatively

TABLE 3
Test No. 3
(Aspergillus niger)

Sample Number	Treatment (Concentration)	GROWTH—4 DAYS (Individual Labortory Results) A	B	C	E	F	H	Mean
0	(Control)	4	4	4	3	4	4	4
I								
7	0.06% (Cu)	4	3–4	4	3	4	4	4
3	0.13% (Cu)	4	2–3	4	3	4	4	4
8	0.25% (Cu)	3	3–4	4	3	3	4	3
13	0.50% (Cu)	3	3	2	2	4	2	3
10	1.00% (Cu)	2	2	1	2	2	2	2
Mean (treatment-laboratory)		3	3	3	3	3	3	3
II								
14	0.13%	4	3	4	1	4	3	3
15	0.25%	4	2–3	4	1	4	4	3
5	0.50%	3	1	3	1	4	4	3
6	1.00%	3	1	1	1	2	4	2
4	2.00%	1	1	1	1	2	1	1
Mean (treatment-laboratory)		3	2	3	1	3	3	2
III								
1	0.03%	4	4	4	3	4	4	4
9	0.06%	4	4	4	3	4	4	4
12	0.13%	4	4	4	3	4	4	4
11	0.25%	4	4	4	4	3	4	4
2	0.50%	3	2–3	3	3	2	4	3
Mean (treatment-laboratory)		4	4	4	3	3	4	4
Mean (laboratory)		3	3	3	2	3	3	3

TABLE 4
Test No. 4
(Aspergillus niger)

Sample Number	GROWTH—14 DAYS (Individual Laboratory Results) A	B	C	E	F	H	Mean
0	1	4	4	4	2–3	4	3
I							
7	4	2	3	4	2	4	3
3	3	2	4	3	2–3	4	3
8	3	1	1	3	1	3	2
13	2	2	2	2	1	2	2
10	1–2	2	1	2	1	1	1
Mean (treatment-laboratory)	3	2	2	3	1	3	2
II							
14	2	2	2	2	2	4	2
15	1	2	4	1	1	4	2
5	1	1	2	1	2	3	2
6	1	1	1	1	1	2	1
4	1	1	1	1	1	1	1
Mean (treatment-laboratory)	1	1	2	1	1	3	2
III							
1	2	4	2	4	2	4	3
9	3	4	3	4	2	3	3
12	1	3–4	2	4	2–3	4	3
11	2	3	2	4	2	4	3
2	2	2	2	4	2–3	2	2
Mean (treatment-laboratory)	2	3	2	4	2	3	3
Mean (laboratory)	2	2	2	2	1	3	2

TABLE 5
Test No. 4a
(Chaetomium globosum)

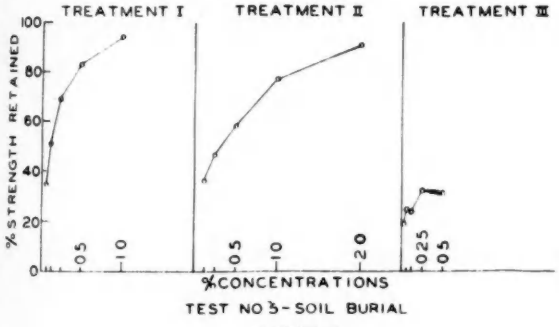
Sample Number	GROWTH—14 DAYS (Indiv. Lab. Results) A	B	F	H	Mean
0	4	4	4	4	4
I					
7	4	3	2–3	2	3
3	3	1	1	3	2
8	1	2	2	1	1
13	1	1	1	1	1
10	1	1	1	1	1
Mean (treatment-laboratory)	2	2	1	1	2
II					
14	4	4	3	4	4
15	4	4	3	4	4
5	2	2	3	2	2
6	2	2	2	1	2
4	1	1	1	1	1
Mean (treatment-laboratory)	3	3	2	2	3
III					
1	4	4	4	4	4
9	4	4	2	4	4
12	4	3–4	2	4	3
11	4	3	1	4	3
2	4	2	2	2	2
Mean (treatment-laboratory)	4	3	2	4	3
Mean (laboratory)	3	3	2	2	3

TABLE 6
Test No. 5. Soil Burial (IV A)
(7 Days Exposure)

Sample Number	Treatment (Concentration)	% STRENGTH RETAINED (Individual Laboratory Results)								
		A	I	J	B	C	K	H	L	Mean
0	(Control)	—	36	0	—	0	3	19	—	12
I										
7	0.06% (Cu)	64	88	78	91	42	100	46	71	73
3	0.13% (Cu)	92	87	74	84	71	100	85	92	86
8	0.25% (Cu)	98	90	81	92	98	100	97	100	95
13	0.50% (Cu)	100	88	79	91	88	100	92	100	92
10	1.00% (Cu)	100	88	82	87	92	100	93	100	93
Mean (treatment-laboratory)		91	88	79	89	78	100	83	93	88
II										
14	0.13%	81	85	74	81	69	91	84	82	81
15	0.25%	89	86	77	86	83	94	87	100	88
5	0.50%	95	85	78	89	100	100	90	98	92
6	1.00%	100	88	80	92	88	98	94	100	93
4	2.00%	95	93	79	84	90	100	92	97	91
Mean (treatment-laboratory)		92	87	78	86	86	97	89	95	89
III										
1	0.03%	17	96	78	18	13	10	62	0	37
9	0.05%	34	100	78	88	15	11	79	0	51
12	0.13%	32	98	83	64	17	14	98	0	51
11	0.25%	49	100	95	100	12	28	100	0	61
2	0.50%	34	87	75	53	25	64	92	19	56
Mean (treatment-laboratory)		33	96	82	65	16	25	86	4	51
Combined treatments										
Dosage	1/16	54	90	77	63	41	67	64	51	63
Dosage	⅛	72	91	76	86	56	68	84	64	75
Dosage	¼	75	91	81	82	72	71	95	66	79
Dosage	½	83	92	85	94	63	75	95	67	82
Dosage	full	76	89	79	75	69	88	92	72	80
Mean (laboratory)		72	90	80	80	60	74	86	64	76

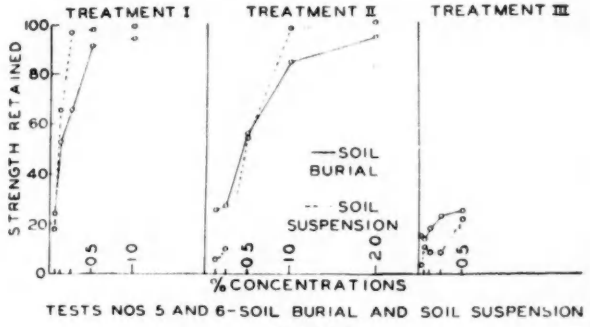
minute amounts of protective treatments and to the fact that in this work some of the participants were employing new and unfamiliar techniques. Although of interest from the standpoint of individual experience, the discrepancies observed are not of serious practical importance, the concentrations in question being considerably below those which would normally be encountered in commercially treated fabrics. Closer agreement of course becomes evident when the concentrations reach a point at which effective protection is afforded. It is also noticeable that, although individual results vary widely in certain cases, the averaged results of all investigators show a consistent relationship between concentration of treatments and per cent fabric strength retained. Indeed there is a distinct trend for the results from each laboratory for each of the tests and treatments to show this consistent relationship.

From Tables 1, 2, 8 and 9 and Figures 1 and 2 it appears that test No. 1 (Chaetomium, direct inoculation sterile specimen method) is appreciably less severe than test No. 2 (Metarrhizium, preinoculation unsterilized specimen method). Test No. 1 distinguishes rather sharply between the control, 1/16, ⅛, and higher dosages, especially for treatments II and III. These trends are reasonably consistent for each laboratory. In a few laboratories all of the concentrations for treatment III are logically ranked. Test No. 2 was effective in nearly all laboratories in differentiating concentrations except for full and ½ doses of all three treatments. A disconcerting feature of the data from the Metarrhizium preinoculation procedure is that the higher concentrations of each type of treatment show an appreciable loss of strength whereas the controls and lower concentrations are relatively higher than they "should be."



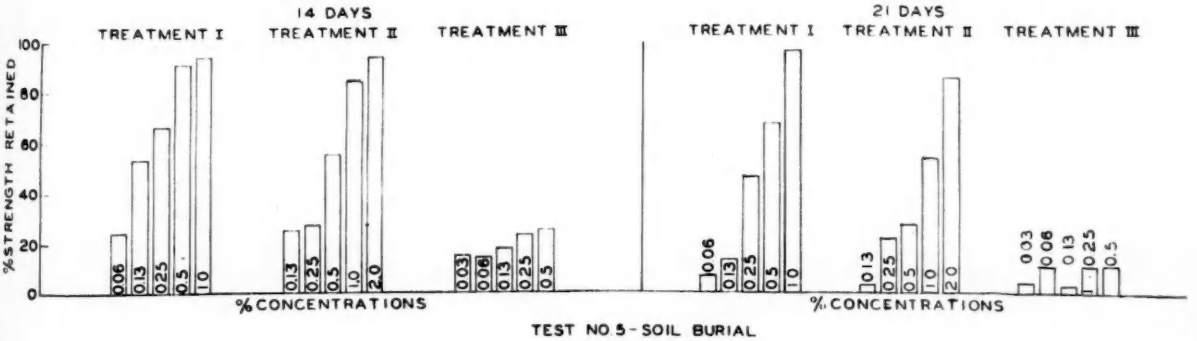
TEST NO 3 - SOIL BURIAL

FIGURE 5



TESTS NOS 5 AND 6 - SOIL BURIAL AND SOIL SUSPENSION

FIGURE 7



TEST NO 5 - SOIL BURIAL

FIGURE 6

TABLE 6
Test No. 5. Soil Burial (IV A)
(14 Days Exposure)

Sample Number	Treatment (Concentration)	% STRENGTH RETAINED (Individual Laboratory Results)									
		A	I	J	B	C	K	H	E	L	Mean
0	(Control)	8	—	0	—	0	0	12	0	—	3
I											
7	0.06% (Cu)	19	83	78	22	0	0	12	0	0	24
3	0.13% (Cu)	36	87	78	97	10	24	46	66	36	53
8	0.25% (Cu)	62	88	78	100	25	52	47	100	44	66
13	0.50% (Cu)	100	86	76	100	81	93	93	94	100	91
10	1.00% (Cu)	95	88	77	99	95	100	100	95	97	94
Mean (treatment-laboratory)		62	86	77	84	42	54	60	71	55	66
II											
14	0.13%	14	81	71	0	5	6	47	0	0	25
15	0.25%	21	52	76	5	4	10	78	0	0	27
5	0.50%	36	88	86	100	31	25	95	0	38	55
6	1.00%	69	85	75	100	65	100	95	100	64	84
4	2.00%	100	96	76	94	97	98	94	100	90	94
Mean (treatment-laboratory)		48	80	77	60	40	48	82	40	38	57
III											
1	0.03%	10	34	73	0	0	0	20	0	0	15
9	0.06%	6	31	2	0	0	0	21	68	0	14
12	0.13%	9	41	38	0	0	0	14	60	0	18
11	0.25%	12	60	62	0	0	0	18	56	0	23
2	0.50%	11	46	71	0	0	0	39	61	0	25
Mean (treatment-Laboratory)		10	42	49	0	0	0	22	49	0	19
Combined treatments											
Dosage	1/16	14	66	74	7	2	2	26	0	0	21
Dosage	⅛	31	57	52	34	5	11	48	45	12	33
Dosage	¼	36	72	67	67	19	26	52	53	27	47
Dosage	½	60	77	71	67	49	64	69	83	55	66
Dosage	full	69	77	75	64	64	66	78	85	62	71
Mean (laboratory)		40	69	68	48	27	34	55	53	31	47

TABLE 6
Test No. 5. Soil Burial (IV A)
(21 Days Exposure)

Sample Number	Treatment (Concentration)	% STRENGTH RETAINED (Individual Laboratory Results)						
		A	B	C	K	H	D	Mean
0	(Control)	0	—	0	0	0	—	0
I								
7	0.06% (Cu)	0	0	0	3	0	39	7
3	0.13% (Cu)	0	37	0	18	2	28	14
8	0.25% (Cu)	0	100	0	62	11	100	46
13	0.50% (Cu)	57	100	34	91	23	97	67
10	1.00% (Cu)	92	100	94	100	81	100	96
Mean (treatment-laboratory)		30	67	26	55	23	73	46
II								
14	0.13%	0	0	0	0	17	0	3
15	0.25%	0	3	0	0	72	56	22
5	0.50%	0	11	0	0	84	69	27
6	1.00%	0	100	22	18	92	87	53
4	2.00%	56	95	72	95	96	97	85
Mean (treatment-laboratory)		11	42	19	23	72	62	38
III								
1	0.03%	0	0	0	0	0	25	4
9	0.06%	0	0	0	0	11	53	11
12	0.13%	0	0	0	0	2	16	3
11	0.25%	0	0	0	0	8	55	11
2	0.50%	0	0	0	0	7	59	11
Mean (traetment-laboratory)		0	0	0	0	6	42	8
Combined treatments								
Dosage	1/16	0	0	0	1	6	21	5
Dosage	⅛	0	13	0	6	28	46	16
Dosage	¼	0	37	0	31	32	62	25
Dosage	½	29	67	19	36	41	80	44
Dosage	full	49	65	55	65	61	85	64
Mean (laboratory)		14	36	15	26	34	59	31

The results of visual evaluation of "mildew" resistance in Tables 3, 4 and 5 are interesting. The nutrient-salts agar method seems to be a somewhat more severe test after 4 days incubation than is the grafting method after 14 days incubation. Otherwise the interpretations as to the effectiveness of treatments or of increasing concentrations appear to be identical for the two methods. From Tables 3 and 4 it is evident that Aspergillus tolerates copper and mercury compounds at high concentrations and is effective in detecting inadequate concentrations of chlorophenolic compounds. Thus it appears that the Aspergillus test using visual estimates of the amount of growth that results, may be a very useful test providing differentiation is made between the growth of Aspergillus growing on the agar surface, which contains dextrose, and on the fiber itself. Comparing Tables 3 and 4 with 5 indicates, as is also shown in Table 1, that Chaetomium is sensitive to copper naphthenate but is moderately tolerant to certain mercury treatments. The data suggest that Chaetomium may be somewhat more tolerant to Treatment No. II than is Aspergillus.

From Tables 6, 8 and 9 it appears that 7 days soil burial tests are inadequate even for 48 x 48 five ounce sheeting except for eliminating such treatments for prolonged soil contact as Treatment No. III. A few of the more severe 7-day burial tests showed detection of 1/16 or ⅛ dosages of Treatments Nos. I and II. The 14 days soil burial showed a nice differentiation of all concentrations of Treatments Nos. I and II at the majority of the laboratories for this weight fabric. Treatment No. III was eliminated at all concentrations for four of the nine stations. At 21 days the two lowest concentrations of copper naphthenate had been eliminated at most of the laboratories and only the two highest concentrations of dihydroxydichlorodiphenylmethane remained. Mercury appeared to be moderately effective in only one 21-day burial test.

On the basis of the limited data available from the Soil Suspension tests, presented in Tables 7, 8 and 9 and Figure 7, reproducibility and general agreement with soil burial results appears to recommend this method as of interest for more extensive testing.

In the absence of actual service data, the overall evaluation of the relative resistance of the different fungicides on the basis of these tests is difficult. The copper naphthenate treatment (I) is seen to be almost immune from Chaetomium attack at concentrations of .125% Cu and above; in the Metarrhizium test it is more definitely affected, the strength loss at .5% Cu being about equal to that observed at .125% Cu with Chaetomium although individual variations are somewhat greater in the Metarrhizium test. In the soil contact tests, which are generally considered very severe, the resistance displayed by the copper treatment at 14 days does not differ greatly from that observed in the Metarrhizium test.

Treatment II (Dihydroxydichlorodiphenylmethane) is also attacked more severely by Metarrhizium than by Chae-

TABLE 7
Test No. 6. Soil Suspension (IV B)

Sample Number	Treatment (Concentration)	% STRENGTH RETAINED (Individual Laboratory Results) 10 Days Incubation C.	10 Days Incubation 1	10 Days Incubation Mean	14 Days Incubation B	14 Days Incubation 1	14 Days Incubation Mean
0	(Control)	0	—	0	—	—	—
I							
7	0.06% (Cu)	48	32	40	24	12	18
3	0.13% (Cu)	92	83	88	90	31	66
8	0.25% (Cu)	100	88	94	100	93	97
13	0.50% (Cu)	100	91	96	100	96	98
10	1.00% (Cu)	100	97	99	100	97	99
Mean (treatment-laboratory)		88	78	83	83	66	76
II							
14	0.13%	34	46	40	12	0	6
15	0.25%	25	37	31	19	1	10
5	0.50%	30	66	48	100	8	54
6	1.00%	100	89	95	100	95	98
4	2.00%	98	79	89	100	100	100
Mean (treatment-laboratory)		57	63	61	66	41	54
III							
1	0.03%	8	29	19	0	8	4
9	0.06%	3	43	23	12	9	11
12	0.13%	8	27	18	8	10	9
11	0.25%	7	44	26	15	3	9
2	0.50%	17	67	42	33	10	22
Mean (treatment-laboratory)		9	42	26	14	8	11
Combined treatments							
Dosage	1/16	30	39	33	12	7	9
Dosage	1/8	40	54	47	40	14	29
Dosage	1/4	46	60	53	69	37	53
Dosage	1/2	69	74	72	72	65	68
Dosage	full	72	81	77	78	69	74
Mean (laboratory)		51	61	57	54	38	47

TABLE 8
Comparative Results of Concentrations Treatments and Laboratories Combined

Test No.	Number of participants	Concentration	% STRENGTH RETAINED High[1]	Low[1]	Average of all
1 Chaetomium—14 days	8	1/16 dose	61	9	37
		1/8 "	87	33	59
		1/4 "	92	60	80
		1/2 "	99	66	90
		Full "	100	88	94
2 Metarrhizium 7 days	8	1/16 "	71	6	29
		1/8 "	74	31	43
		1/4 "	82	33	58
		1/2 "	84	52	75
		Full "	100	60	79
5 (a) Soil Burial—7 days	8	1/16 "	90	41	63
		1/8 "	91	56	75
		1/4 "	95	71	79
		1/2 "	95	63	82
		Full "	92	69	80
(b) 14 days	9	1/16 "	74	0	21
		1/8 "	57	5	33
		1/4 "	72	19	47
		1/2 "	83	49	66
		Full "	85	62	71
(c) 21 days	6	1/16 "	21	0	5
		1/8 "	46	0	16
		1/4 "	62	0	25
		1/2 "	80	19	44
		Full "	85	49	64
6 (a) Soil Suspension 10 days	2	1/16 "	39	30	35
		1/8 "	54	40	47
		1/4 "	60	46	53
		1/2 "	74	69	72
		Full "	81	72	77
(b) 14 days	2	1/16 "	12	7	9
		1/8 "	40	14	29
		1/4 "	69	37	53
		1/2 "	72	65	66
		Full "	78	69	74

[1] High and low (from "Combined Treatments," Tables 1, 2 and 6) to indicate the range of averages for 3 treatments for each dosage by laboratories is given to permit a rough comparison of the reproducibility of test methods in detecting inadequate concentrations.

tomium. It shows somewhat less resistance than the copper treatment to soil contact after 14 days.

Treatment III (phenyl mercury triethanol ammonium lactate) although performing moderately well in certain pure culture tests appears to be the least resistant of the three compounds and especially so in the soil contact tests.

From a study of these results it would appear possible to arrive at a fairly practical evaluation of fungicidal treatments by the use of two or more tests including one or more pure culture and one soil contact test.

EXTRACTED COMMENTS FROM COOPERATING LABORATORIES

A survey of the reports received indicates that in general the procedures given in the testing directive were closely followed, some variant methods being employed by individual laboratories due to lack of facilities or in order to secure more complete information in special cases.

The pronounced water repellency of the test fabric is frequently mentioned as causing difficulty in pipette inoculation, spraying specimens with the inoculum having been resorted to in at least one case.

One investigator confirms the need of 14 days incubation for Chaetomium, pointing out that growth of this organism frequently occurs between 7 and 14 days.

In the Metarrhizium test one comment was to the effect that placing fabric specimens on a vigorously growing mat of the organism is a more severe treatment than direct inoculation of the specimens.

Several reports mention considerable contamination by other organisms occurring in the tests which employed the "grafting" method of inoculating specimens.

A rather interesting range of soil mixtures was employed in the soil burial test, although soil details were not given by all participants. Soil types recorded include:

Mushroom compost, pH 7.0 for Laboratory H.

Good garden soil, pH 6.2 for Laboratory B.

50-50 mixture greenhouse pot soil and plant fertilizer, for Laboratory E.

Arlington Farms soil, pH 5.5 for Laboratory D.

Two parts decomposed hardwood leaf liter, one part clay loam, pH 6.9 for Laboratory A.

Topsoil, sand, manure mix, pH 6.8-7.4 for Laboratory K.

In the majority of cases reported, soil moisture and temperature were closely controlled throughout the test.

In the soil suspension test employing

TABLE 9
Comparative Results of Treatments—Dosages and Laboratories Combined

Test No.	Number of Participants	Treatments	% STRENGTH RETAINED (Ranges and averages by laboratories) High[1]	Low[1]	Average of all
1 Chaetomium 14 days	8	I	99	73	84
		II	99	53	70
		III	93	28	61
2 Metarrhizium 7 days	8	I	91	51	67
		II	77	43	57
		III	69	23	45
5 (a) Soil Burial 7 days	8	I	100	78	88
		II	97	78	89
		III	96	4	51
(b) 14 days	9	I	86	42	66
		II	82	38	57
		III	49	0	19
(c) 21 days	6	I	73	23	46
		II	72	11	38
		III	42	0	8
6 (a) Soil Suspension 10 days	2	I	88	78	83
		II	63	57	61
		III	42	9	26
(b) 14 days	2	I	83	66	76
		II	66	41	54
		III	14	8	11

[1] From "Mean (Treatment-Laboratory)," Tables 1, 2 and 6.

the agar medium modification one laboratory found that specimens retained too much moisture after shaking with the inoculum, rendering it necessary to press them lightly between sheets of filter paper before incubation.

OUTLINE OF TEST METHODS FOR COOPERATIVE SERIES OF AATCC STUDIES ON MILDEW- AND ROT-RESISTANCE PROCEDURES

I. *Purpose and scope.*

At a meeting of the AATCC Subcommittee on Mildewproofing held in April, 1943, an extensive interlaboratory program of testing fungicidally treated cotton fabric was agreed upon, for the purpose of studying and standardizing testing procedure for determining resistance to mildew and rotting. The methods chosen for study do not include all methods in use in testing mildewproofed and rotproofed fabric. They were selected to eliminate variations that appeared to be unnecessary or undesirable. Certain methods or alternative procedures are included where data were lacking as to their value, in order that they might be definitely eliminated or incorporated in standard tests.

II. *Preparation of specimens:*

A. *Raveled strip or grab break specimens.* Specimens should be prepared, conditioned, and broken as specified by Federal Specification CCC-T-191-A and A.S.T.M. Standard D 39-39. Grab or strip method, as preferred, may be used. Since the amount of material available for these tests is somewhat limited, it is hoped that as many laboratories as have suitable facilities will employ the raveled strip method. Unless it is specifically desired to make filling breaks, the raveled strip specimens should be cut 1½" in width by 6" in length, the long dimension being parallel to the warp yarns. Each specimen is raveled to one inch in width by taking from each side approximately the same number of yarns. If, however, specimens are to undergo leaching or other modifying tests in which fraying or raveling is likely to occur, they should be cut oversize (8 inches in length, with the long dimension in the direction of the filling, by 6½ inches in width) and later subdivided into 5 strips as described above. If grab break specimens are desired, they should be made in accordance with accepted practice.

Prior to making any breaking strength determinations, the specimens should be conditioned by thoroughly drying them, followed by storage at 65% relative humidity and 70° F. for 24 hours.

B. *Water leaching.* The specimens are to be water leached for all tests except the soil burial test. Fabric specimens are fixed in position by means of a metal screen or glass rods beneath the surface of a water bath so that water may circulate freely below and above the fabric. The water-fabric ratio shall be 100 to 1. The flow of water entering the bottom of the bath is so regulated that one complete change of volume occurs 3 times in 24 hours. The temperature of the water shall be 80±5° F. and have a pH of approximately 7. The specimens are to be water leached for 24 hours previous to tests. The exact temperature, pH, and volume ratio used for the water leach procedure shall be recorded. Fabric specimens which have been treated with different preservative compounds should not be leached in the bath at the same time.

III. *Microbiological tests.*

NOTE: Pure cultures of the organisms specified for the following tests may be obtained upon request from the Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Maryland. The cultures shall be carefully maintained and promptly renewed if there is any suspicion of contamination.

A. *Chaetomium globosum.* U.S.D.A. culture No. 1042 shall be used.

Culture medium: The culture medium shall have the following composition:

Distilled water	1,000.0 ml.
Sodium nitrate	3.0 g.
Dipotassium hydrogen phosphate	1.0 g.
Magnesium sulphate	0.25 g.
Potassium chloride	0.25 g.
Agar	10.0 g.

If necessary adjust the pH carefully to 6.8, using hydrochloric acid or sodium hydroxide.

Inoculum: Prepare 250 cc. Erlenmeyer flasks containing enough glass beads to cover the bottom, one or two discs of filter paper, and 15 cc. of culture medium. Sterilize flasks and inoculate with Craetomium spores from pure stock cultures. Incubate at 28° C. for 5 to 7 days, at which time the filter papers are covered with gray fruiting bodies. Shake the flasks until the inoculum is dispersed by the action of the glass beads. Add 50 ml. sterile nutrient medium and pipette off the suspension.

Culture chamber, inoculation, and incubation: Melt the agar-salts medium in an autoclave. Distribute into 16-oz. modified screw cap bottles, 2½ inches square by 6 inches high. The modified screw cap is prepared by cutting a circle, 4 cm. in diameter, from the center of both the cap and the cap liner. A round piece of glass filter fabric (such as Owen-Corning "Fiberglas"—C. S. 30A-20) the diameter of the cap liner, is inserted between the cap and the ring of liner. Use about 40 ml. of medium to each bottle. Sterilize at 15 pounds pressure for 20 minutes. After sterilization place the bottles on their sides and allow the agar to harden. Place one steam-sterilized specimen in each culture flask, using flamed forceps.* With a sterile pipette distribute 2 ml. of the inoculum along the length of the specimen. Incubate at 28° C. for a period of 14

* For method of sterilizing specimens or additional details that may be needed, see U. S. Army Corps of Engineers Specification T-1452-A.

days. Remove the specimens, wash, and recondition for breaking strength determinations.

B. *Metarrhizium glutinosum* U.S.D.A. culture No. 1334.2 shall be used.

Culture medium: The culture medium shall have the following composition:

Ammonium nitrate	5.0 g.
Dipotassium hydrogen phosphate	7.0 g.
Magnesium sulphate	3.5 g.
Agar	10.0 g.
Distilled water	1,000.0 ml.

Inoculum: Use the same procedure as designated under III-A above.

Culture chamber, inoculation, and incubation: Melt the medium in an autoclave. Distribute into 16-oz. modified screw top bottles as described in III-A above. After sterilization place the bottles on their sides and allow the agar to harden. Oven sterilize some strips of filter paper 1 inch by 4 inches at 160° C. for one hour and place on the agar in the bottles under aseptic conditions just before the agar becomes completely hard. Inoculate the filter paper with 2 ml. of spore suspension, distributing the inoculum evenly over the filter paper by means of a sterile pipette. Incubate at 85° F. for 4 days. At the end of this incubation period wet out each test strip with unsterilized culture medium to which has been added 0.005% of a non-toxic wetting agent such as Gardinol W. A., and lay out the unsterilized test specimen on the fruiting filter paper agar mat. Smooth out to assure complete contact. Incubate the test specimens at 85° F. for a 7-day period. Remove the specimens, wash, and condition for breaking strength determinations.

C. *Aspergillus niger.* U.S.D.A. culture No. 215-4247 shall be used.

1. *Nutrient salts—agar method.*

Culture medium: The culture medium shall have the following composition:

Dipotassium hydrogen phosphate	1.4 g.
Magnesium sulphate	0.7 g.
Ammonium nitrate	1.0 g.
Dextrose	2.5 g.
Peptone	2.5 g.
Agar	10.0 g.
Distilled water	1,000.0 ml.

Inoculum: Use the same procedure as designated under III-A above.

Culture chamber, inoculation, and incubation: Melt the medium in an autoclave, as described under III-A above. After sterilization, place the bottles on their sides and allow the agar to harden. Sterilize unraveled test specimens, 6" x 1½", are placed on the agar under aseptic conditions, prior to the agar's becoming completely hard. Inoculate the specimens with two ml. of spore suspension. Incubate at 85° F. for four days. Record the amount of growth that has occurred on each strip of fabric under the classification: 1 = none; 2 = slight; 3 = medium; 4 = heavy. Breaking-strength tests are not required.

2. *Malt extract—Partansky method.*

Inoculation of Test Specimens by "Grafting."

Preparation of mold culture: Malt yeast agar contained in sterile petri dishes is seeded by swabbing with a suspension of the test organism. Malt yeast agar contains:

30 gms. Malt Extract (Difco)
5 gms. Yeast Extract (Difco)
15 gms. Agar (Difco)
1000 ml. water (distilled)
Adjust ph to 6.8 with .1N NaOH or HCl

Separate samples are run using *Chaetomium globosum* and *Aspergillus niger.* The fungi are incubated until they have developed to the stage at which sporangia are beginning to form. Our experience is that *Chaetomium globosum* requires about 48 hours at 30° C. while *Aspergillus niger* requires only 19 to 24 hours at 30° C.

At the time that the sporangia are just forming, duplicate test strips (1½" x 3") of treated and untreated fabric are dipped in distilled water and pressed firmly onto the mold mycelium. The strips remain in contact with the mold until the area around the sample is well sporulated. For *Chaetomium globosum* 3 days are required, while 24 hours is usual sufficient for *Aspergillus niger.*

The strips are removed from the mold pad and placed in 10 cm. petri dishes containing Thom's agar (a non-nutrient agar), exposed side up. Thom's agar contains:

3.00 g. $NaNO_3$
0.25 g. KH_2PO_4
0.25 g. KCl
0.01 g. $FeSO_4.7H_2O$
10.00 g. agar
1000 ml. H_2O

Adjust pH to 6.8 with .1N NaOH or HCl.

After 2 weeks incubating, adequately treated samples should be free of mildew, whereas untreated samples should be well covered with mold.

IV. *Soil contact tests.*

A. *Soil burial.*

Soil mixture and physical conditions: It is not as yet possible to specify a completely standardized soil mixture for use in this test. For critical evaluation of treatments of fabric that is likely to be subjected to soil contact in diverse localities, tests should be conducted with more than one type of soil. In general, a soil prepared in accordance with directions given in A.S.T.M. Designation D 684-42T, Army Tentative Specification J.Q.D. 242 (December 2, 1942), or Supplement No. 1, Schedule of Methods of Testing Textiles, Canadian Government Purchasing Standards Committee, June 8, 1943, should be satisfactory for the purpose. A mixture prepared by using equal parts of good top soil or leaf mold, well rotted and finely shredded manure, and a clean and rather coarse sand has been successfully employed. From whatever source secured, the soil used in this test should be of a nature highly favorable to microbial activity and rich in cellulose-destroying organisms. It should be sufficiently porous in texture to permit ready penetration of air and moisture, and should not become sticky or tend to pack too closely when damp.

The pH range of the soil mixture should be recorded. (A soil of approximately pH 7.0 is preferred.)

The prepared soil is contained in suitable trays or shallow boxes which may be of wood, glass, porcelain, earthware, etc., in beds at least 5 inches in depth. The beds are placed in a greenhouse, laboratory, or other room, preferably in a specially constructed cabinet, where they are not exposed to direct sunlight and where soil temperature and moisture content can be closely controlled.

The soil should be maintained as nearly as possible at a uniform temperature of 85° F. throughout the test, soil temperature being regulated by that of the surrounding atmosphere.

A uniform moisture content of 65-70% of the soil moisture-retaining capacity should be maintained. For the above-described soils this should be equivalent to approximately 25-30% moisture on the oven-dry basis. If possible, the soil should first be weighed in the air-dry condition and brought to the desired moisture content by adding the calculated amount of water. Moisture content should be regularly checked during the test, with replacement of water lost by evaporation. Such addition should be made in a fine spray to avoid washing or deformation of the bed. Evaporation loss can be minimized by maintaining controlled high humidity conditions in the surrounding atmosphere.

Burial of specimens: Uniformity of fabric attack by soil organisms may be strongly influenced by the manner in which burial of specimens is made, so care should be exercised to insure identical procedure throughout the tests. In general, it has been observed that the activity of organisms at or near the soil surface is adversely affected by changing temperature, loss of moisture through evaporation, and perhaps other causes. The more closely such conditions are controlled, the more nearly uniform activity results at all levels of the soil bed.

If soil moisture and temperature are uniform throughout, either vertical or horizontal burial of specimens should give

(Continued on Page P139)

New Developments in PERMANENT CELLULOSE FINISHES*

SIDNEY M. EDELSTEIN
The Hart Products Corp.

EXACTLY one hundred years ago, a middle-aged dyer and chemist was at work in a printing plant in England filtering chemical solutions through cotton cloth. As he started to filter "alkali maker's red liquor," he noticed that the cloth began to contract greatly and soon became transparent. This man was John Mercer and the contraction caused by the strong caustic was the first performance of the mercerization process. The transparent cotton filter bag resulting from this treatment was the first known fabric to be given a permanent cellulose finish.

Even though an eventful one hundred years has passed since that time, we must return to Mercer's original process in our discussion of the catalytically activated caustic solutions of cellulose known commercially as Celfons† and Kopans.** For these solutions constitute the newest developments in the field of permanent cellulose finishes. The reaction used in the preparation of these solutions is simply Mercer's own principle of the swelling of cellulose by strong caustic—carried to the point where the cellulose is dissolved.

Since we have said that permanent cellulose finishes start with the work of John Mercer and after a hundred years return to this work, the question comes up as to what has been done on this subject during the intervening period.

In order to answer this question at least briefly, we must first define a cellulose finish and also one that is "permanent."

For this discussion we define a cellulose finish as a textile finish whose characteristics are due either to some change in the cellulose of the textile itself or to the addition of cellulose or a slightly modified cellulosic material to the textile. By a "permanent" finish we mean one that is not removed materially or substantially changed by washing or dry cleaning.

In accordance with this definition of a permanent cellulose finish we must include in one group those processes which modify the cellulose of the textile such as mercerization, the Haberlein and the cuprammonium process. In the second group we include viscose solutions, cuprammonium solutions of cellulose and caustic solutions of cellulose ethers; all of which produce a permanent cellulose finish by the addition of cellulose or modified cellulose to the treated material.

As will be shown later, the catalytically activated caustic solutions of cellulose belong to the second group.

The first of these processes, mercerization, after modification by Lowe in 1890 was and still is of great commercial importance. The increased luster, dye affinity and strength imparted to millions upon millions of yards of cotton yarns and fabrics by Mercer's process certainly bear testimony to this importance.

It was well known that these effects were related mainly to the swelling of the cotton fibers in the strong caustic. The thought occurred to someone that if the swelling of the cotton fibers could be carried even further, that is, to the point where the fibers were partially dissolved, even more unusual results might be obtained. The means for accomplishing this was at hand in the form of an ammoniacal solution of copper oxide, the solvent action of which also had been discovered by Mercer.

The cuprammonium treatment did produce some new effects. These effects were somewhat limited, however, and were suitable only for certain fabrics. The process became well known under several modifications, the most familiar being the Willesden process. In this treatment, cotton duck and sailcloth were passed rapidly through a suitable cuprammonium solution and then dried. The surface portions of the fabric were dissolved by the solution and reprecipitated upon vaporization of the ammonia. The copper was allowed to remain in the fabric, thus protecting it from mildew. The reprecipitated cellulose served to decrease the porosity of the fabric and to increase its strength.

The cold sulfuric acid or Haberlein process next sought to accomplish a somewhat different effect by a similar type of action. By passing a light weight cotton fabric rapidly through cold sulfuric acid of the proper strength followed by washing, the surface of the fiber is partially dissolved but not enough of the dissolved cellulose is reprecipitated to fill in the interstices of the cloth. The result is a sheer crisp (organdy) fabric which retains its appearance on repeated laundering.

Besides equipment and other factors, it was soon realized that any process which depended on the split-second action of a solvent on the fabric would necessarily be limited in its application because of difficulty of control and lack of flexibility. The answer to this problem was the application of a solution of cellulose to the fabric, the cellulose in the solution coming from an outside source instead of from the textile material itself.

Cellulose xanthate in caustic soda, commonly known as viscose, was one of the earliest solutions used in this manner. While still in use in one or two large plants, the special precautions needed in preparing and using this material together with the considerable equipment required has prevented its widespread adoption.

The use of cuprammonium solutions of cellulose for producing a permanent cellulose finish on textiles did away with the fire hazards and some of the manufacturing difficulties of the viscose method but it presented other problems. The high cost of the copper in the solution alone required installation of expensive and complex recovery equipment far beyond the economic reach of most textile plants.

During the course of an investigation of cellulose ethers some 30 years ago, it was found that cellulose which had been partially etherified was soluble in cold caustic soda. The advantages of caustic soda as a solvent for a cellulosic material were soon realized. This led to the practical development of solutions of cellulose ethers in caustic for the production of permanent finishes. Solutions of this type have become well known in the last few years under the trade name of Ceglin.

In the formation of the cellulose solutions which we have so far described, two basic principles are noted. Either a solvent such as cuprammonia, which has enough swelling power to dissolve ordinary cellulose is used or else the cellulose is so changed chemically that it becomes soluble in caustic soda.

Each of these principles has advantages which are accompanied however by disadvantages. The first one offers the ease of direct solution with the disadvantages of expensive solvents difficult to control. The advantage of the low cost and stability of the caustic soda in the second method is offset by the necessity of converting the cellulose into a cellulose derivative.

* Presented at meeting, Philadelphia Section, November 17, 1945.

† General Dyestuff Corporation.

** Hart Products Corporation.

An ideal method would combine the good points of both methods without their bad points. In other words, cellulose would be dissolved directly in caustic soda.

In the preparation of the catalytically activated caustic solutions of cellulose, use is made of such a method. These solutions are made by dissolving cellulose itself directly in caustic soda whose solvent power has been greatly increased by the addition of catalytic agents.

In the following discussion of the catalytically activated caustic solutions of cellulose, these solutions will be referred to simply as c.a.c. solutions of cellulose.

PREPARATION OF THE C.A.C. SOLUTIONS OF CELLULOSE*

In the preparation of the c.a.c. solutions of cellulose, use is made of a few simple principles connected with the swelling of cellulose in caustic soda. As mentioned previously, Mercer found that cellulose immersed in caustic soda swelled greatly but did not dissolve. Now solution of the cellulose would take place if the swelling power of the caustic were greater than the cohesive power of the cellulose. This is shown by the fact that caustic which only swells normal cellulose dissolves cellulose whose cohesive force has been reduced by chemical means. The direct solution of cellulose in caustic soda thus requires that the swelling force of the caustic be increased to the point where it will be greater than the force holding the cellulose together.

This is accomplished in the formation of the c.a.c. solutions by the addition of zinc or any one of a small group of related chemical elements to 8 per cent to 12 per cent caustic soda and then cooling the solution to 40° F., or lower. When cellulose in the proper degree of subdivision is placed in contact with this solution, it instantaneously dissolves to give a cellulose solution which is stable when warmed to room temperature.

PROPERTIES OF THE C.A.C. SOLUTIONS

Commercially the c.a.c. solutions of cellulose are available as Celfons and Kopans containing 5 per cent to 7 per cent cellulose and 8 per cent to 10 per cent caustic soda and in viscosities ranging from 100 to 5000 centipoises. Specially prepared cellulose pulps and concentrated activated caustic are also available for preparing the solutions within the finishing plants.

All c.a.c. solutions of cellulose may be diluted to any cellulose content with 6 per cent caustic without precipitation of the cellulose. The cellulose is precipitated by the addition of acids, strong salt solutions, alcohol, hot water, caustic of mercerizing strength or by heating to above 160° F.

METHODS OF APPLICATION

The c.a.c. solutions of cellulose may be applied to a large number of textile materials to obtain a variety of permanent effects, although cottons, rayons and acetates, both woven and knitted, have been most important so far. In addition to permanent finishes ranging from a soft full hand to a sheer organdy effect, many other important properties of the fabric may be greatly improved. Among the most important of these improvements may be mentioned decreased shrinkage, increased tensile strength and abrasion resistance. Obtaining the particular effects desired will depend on the proper choice of the method of application and of the viscosity and strength of the cellulose solution as well as on the nature of the fabric to be treated.

The basic method used in treating fabrics with c.a.c. solutions of cellulose is simple. The fabric is wet with the solution and after removal of the excess, the cellulose is coagulated on the fabric and the latter is then rinsed and dried. Upon coagulation, the cellulose firmly adheres to the fabric and at that time becomes a permanent part of the treated textile.

The c.a.c. solutions of cellulose are applied to the cloth by means of a padder, quetsch or mangle. In certain cases the solutions are applied in a backfilling machine. For most fabrics, rubber squeeze rolls of medium density are used and the solution may be applied at the nip or by immersion. Brass and copper are to be avoided at all points in contact with the c.a.c. cellulose solutions. Rubber, stainless steel, Monel, iron and plain steel are satisfactory for contact with the material.

There are three basic procedures for coagulating or fixing the cellulose on the cloth after padding on the cellulose solution. The first and most important method involves coagulation with acid while the second depends on the action of drying. In the third method, the cellulose is applied and coagulated on the cloth in the mercerizing process.

While any of the three procedures may be carried out in batch operation, most satisfactory results are obtained when the application and coagulation of the cellulose are carried on continuously.

The choice of the coagulating bath in the first method depends on the type of finish desired and on available equipment. In general dilute sulfuric acid of ½ per cent to 5 per cent strength is used as this acid is inexpensive and gives the most rapid coagulation of the cellulose. Formic acid is similar to sulfuric in its action while acetic acid is somewhat slower and tends to give a much softer finish. In a few special cases, hot water, bicarbonate of soda or concentrated salt solutions are used in place of the acid for coagulation. A pad in series with a three or four compartment washer is well suited for the acid procedure as application of the cellulose to the fabric, coagulation and washing may be carried on rapidly and continuously.

In the second method of coagulation, the padded fabric is dried on cans or on a tenter frame. Removal of only half of the water in the cellulose solution will cause coagulation of the cellulose and thus only semi-drying is necessary. Full drying to low moisture content is satisfactory however as the catalytic material in the c.a.c. solution tends to prevent oxycellulose formation. After drying, the fabric may be washed with hot water or soured with acid to remove the alkali in the goods. Drying methods of coagulation are most suited for cottons and are indicated where an open or sheer fabric with maximum development of finish is desired. Where shrinkage control is important, coagulation of the cellulose by drying the fabric to width on the tenter will give the best results.

Because of the coagulating effect of mercerizing caustic on the c.a.c. solutions of cellulose, we have a means of combining two processes. The c.a.c. solutions of cellulose may thus be applied either in a separate pad or in the first caustic box of a mercerizer and the extra step of coagulation by acid or by drying eliminated. The only precautions required are that the mercerizing caustic be at least 45° tw. and that the washing on the mercerizing frame be as warm as possible. The advantages of this method particularly where the goods would normally be mercerized are obvious.

Since the cellulose in the c.a.c. solutions is held firmly bound to the fabric upon coagulation and is not removed by any of the treatments which cotton and rayon undergo, we have a wide choice as to what point the cellulose solution is applied to these fabrics. The cellulose solutions may thus be applied to grey fabrics before kier boiling or boiling off or they may be applied to the boiled-off or kiered goods before or after bleaching, mercerizing or dyeing. When applied after dyeing, however, care must be taken to use colors which will be unaffected by passage through alkali and acid. The particular point of application of the c.a.c. solutions of cellulose will depend on the fabric and the type finish desired, as well as on the equipment and routine in the mill.

Not only does the coagulated cellulose hold firmly to the fabric treated with the cellulose solutions but in addition the cellulose will bind many other insoluble substances to the fabric. Such materials

* These solutions, as well as their manufacture and applications are covered by issued patents or patents pending.

as clays, talc, fillers, delusterants and pigments accordingly may be added to the c.a.c. solutions of cellulose and upon coagulation of the cellulose on the goods, they are bound strongly enough to resist kiering, washing and other treatment. By this process permanent weighted, colored and other effects may be obtained by the proper choice of the added materials.

PIGMENT DYEING

The strong binding power of c.a.c. cellulose for pigments has furnished a new and important means of pigment dyeing which can be carried on simultaneously with finishing. All pigments are of course not siutable for this work as they must be specially selected to withstand the action of caustic. A fairly large group of pigments are available in a wide range of shades, however, which meet these requirements. For practical results these pigments must be further processed so that they may be mixed easily with the c.a.c. solutions of cellulose and remain in suspension under operating conditions. The pigments for this work must also be processed so that the finishing properties of the c.a.c. solutions to which they are added are not affected.

Commercially processed pigment dispersions in a wide range of shades for use with the c.a.c. solutions of cellulose are available under the name of Celludye pigment colors*. These pigment dispersions may be added to any of the c.a.c. cellulose solutions in amounts ranging from 0.2 per cent for certain pastel shades to as high as 20 per cent for heavy shades, without affecting the properties of the cellulose solutions. The application of the c.a.c. cellulose solutions with pigment colors is carried on in the usual manner, although best color results are obtained on fabrics which have been thoroughly kiered or boiled off.

APPLICATION TO MILITARY FABRICS

The most important use for almost all finishing materials today and for the past several years has been in application to fabrics for war use. The c.a.c. solutions of cellulose are no exception. Among the various military textiles finished with c.a.c. solutions of cellulose, the best known are perhaps the mosquito and insect nettings as many millions of yards of these fabrics have been used by the armed forces. A brief review of these fabrics and the part that the c.a.c. cellulose solutions have played in their development will serve not only to show the versatile properties of these solutions but also one example among many of the encouragement and cooperation provided by the Philadelphia Quartermaster Depot.

Some time before Pearl Harbor, the Quartermaster Depot began purchases of mosquito netting made from several types of woven and knitted fabrics. It was realized that a finish of a permanent character was required on the woven marquisettes to prevent slippage of the threads as well as for shrinkage control and accordingly specifications were set up for such a laundry resistant finish on the marqaisettes. The only satisfactory finish brought forward at that time was the well known cold sulfuric acid process. A disadvantage of this process was of course the fact that only a very few plants had the necessary equipment for carrying it on. Since the knitted and lace fabrics presented no slippage problem no finish other than the usual starch and gum was required on these fabrics.

An unexpected problem soon arose with the knitted fabrics. Many of these nettings after being knitted and finished in the normal manner showed wash shrinkages far in excess of the specifications set up by the Depot.

Based on laboratory results shown to the Depot, it seemed as if the c.a.c. solutions of cellulose might eliminate the shrinkage problem on the knitted fabrics. Arrangements were made for trials on a practical scale and the results were highly satisfactory. Not only was the wash shrinkage reduced to a figure lower than the specification required but the fabric was given a desired finish which was not removed on washing. The application of a permanent cellulose finish to knitted nets was soon made a part of the specifications.

Since the machinery required for application of the c.a.c. solutions could easily be set up and since the results obtainable met all specifications, many plants adopted this material for treating the marquisettes. This became especially important as increased quantity required additional processing facilities, with the result that today a high percentage of these military marquisettes are finished with the c.a.c. solutions of cellulose.

When requirements for color on the nettings resistant to weather were presented, it became an easy matter to add the proper pigment dispersions to the c.a.c. cellulose solutions and finish in the normal manner.

Other requirements on these fabrics have been added until today we find c.a.c. cellulose solutions, pigment colors, antimildew agents and in some cases even water repellants, being applied together in one bath. The result is a mildew resistant fabric having, colors resistant to light and washing, a low shrinkage, improved tensile strength and slippage as well as a permanent hand resistant to washing.

In a similar manner many other military fabrics have been helped to meet specifications of many kinds by being processed with the c.a.c. cellulose solutions.

CIVILIAN AND POST-WAR APPLICATION

Since the c.a.c. solutions of cellulose are so versatile both in the type of textile materials to which they may be applied and in the type of permanent effects that may be produced, any attempt to enumerate all of their possible applications would be out of the question. We do wish to present the following few practical examples with the thought that they may suggest many other possibilities.

Warp knit and lace fabrics

The experience gained in finishing many millions of yards of light weight tricot and similar cotton fabrics with the c.a.c. solutions of cellulose for war use is leading to the production of similar fabrics for civilian use with a greater serviceability for the consumer.

In the past fabrics of this type have been finished with starch and gums partly to give a pleasing finish but mainly to hold the fabric out to its finished width and form. When fabrics so finished are washed, the usual sizing comes out and the fabric collapses. The housewife generally has to restarch the fabric and attempt to stretch the fabric back to its original form in order to have a curtain or garment at least similar in appearance to the original.

Application of the c.a.c. cellulose solutions to these fabrics even in the grey and in rope form is resulting in fabrics with greatly reduced shrinkage and without the need for restarching. Much better results are obtained, however, by applying the cellulose solution to the boiled off goods and coagulating by drying to width on the tenter.

Extremely fast pastel shades are obtained on either the grey or boiled off goods by the addition of pigments to the c.a.c. solutions, thus eliminating dyeing. Even bleaching may be eliminated on these fabrics by the addition of certain white pigments to the cellulose solution. Operating under the best conditions, tricot fabrics which when finished in the usual manner, show a wash shrinkage of 30 per cent in either direction, have shown a 6 per cent shrinkage when finished with the proper c.a.c. solution of cellulose. Similar results have been obtained with rayon and acetate fabrics.

Organdy effects

Seventy-six x 72 and 84 x 80 cotton lawns as well as batistes have been treated with high viscosity c.a.c. cellulose solutions to obtain satisfactory permanent organdy finishes. The cellulose solution is applied to the fabric after kiering and coagulation is carried out by frame drying. The sheerest effect is obtained if the fabric is mercerized before or after application of the cellulose.

* Celludye Corporation.

A new development in the field of organdy type finishes on lightweight spun and filament rayons has been the application to these fabrics of certain c.a.c. solutions developed especially for this purpose. The treatment of these fabrics with the usual cellulose solutions has produced a stiff papery hand without the desired sheerness. By increasing the amount of catalyst in the normal c.a.c. solution of cellulose, a solution is obtained which gives the desired hand and sheerness to the fabrics. The application is carried on in the usual manner on a continuous machine. The results so far obtained on a number of fabrics indicate the possibility of new rayon textiles heretofore thought impossible.

Shirtings

A pleasing finish and appearance which is retained after a number of washings together with a 1 per cent to 2 per cent increased yardage after Sanforizing is obtained by the application of the c.a.c. solutions of cellulose to cotton shirtings. In treating these fabrics, the procedure is greatly simplified by applying the cellulose solution as a part of the mercerizing process. The singed grey goods are padded through a medium viscosity c.a.c. cellulose solution, passed through the mercerizing caustic and washed on the frame in the usual manner. In this way no extra coagulating treatments are required and the goods pass through the normal plant routine including kiering and bleaching.

Filament Rayons

A large finishing plant engaged in dyeing, printing and finishing pigment taffetas and light rayon twills was confronted with a problem which was eliminated by the application of c.a.c. solution of cellulose to these fabrics.

Both of these fabrics are notorious for their high degree of slippage and this plant was applying a resin slipproof as a final finish. This resin finish reduced the slippage of the fabrics but the damage had already been done. During the boiling off, dyeing and printing that the fabrics underwent a great deal of slippage and distortion had taken place. The slipproof at the end simply locked in the imperfections and the seconds reached a high figure. By applying a low viscosity c.a.c. cellulose solution to the grey fabric, the yarns were locked in place and the distortion during processing was eliminated. In this particular plant a pad, acid sour box and rinse box were installed in series with the continuous boil off machine and the whole process was made continuous. Besides reduction of seconds to a low figure, fabrics are now being obtained which retain their fullness and life after a number of washings.

Pile Fabrics

Woven pile fabrics with a cotton back and rayon pile have become increasingly important in the medium and low priced field. When used as upholstery fabrics, it is important that the pile be anchored thoroughly to the back. Before the war this was accomplished by backfilling these fabrics with a rubber solution or emulsion followed by drying. With the scarcity of rubber resulting from the war, other binding agents were required and the c.a.c. solutions of cellulose were found quite suitable for anchoring the pile in these fabrics.

Grey or boiled off fabrics of this type are now backfilled with a high viscosity c.a.c. cellulose solution and then soured, rinsed and dried. Brushing and shearing are carried out in the usual manner. The resultant fabric shows excellent binding of the pile to the back.

Spun Rayons

Considerable interest has been recently aroused in the field of washable spun rayons. Improved testing procedures and standards for fabrics of this type have been put forward by the rayon producers and the consumer is becoming increasingly conscious of developments in this field. One of the most interesting applications of the c.a.c. solutions of cellulose has been to washable spuns, particularly in connection with vat dyeing.

In this new application, the cellulose solution acts both as a means for controlling the shrinkage of the finished fabric and as an assistant in the application of the vat dyes.

The vat pigments are dispersed in a low viscosity c.a.c. cellulose solution and the boiled off spun fabric is padded through this solution. After padding the cellulose is coagulated with acid whereupon the vat pigments become thoroughly fixed to the fabric. After rinsing, the goods are reduced in the usual caustic-hydrosulfite bath and finished in the normal manner.

Since the vat pigments are fixed to the fabric, there is practically no loss of color in the reduction bath and the reduction may be carried out in a dye beck as well as on a jig. The resultant fabric has a full lofty hand with thorough penetration of the color.

In addition to the above advantages, spun rayons which usually show an 8 per cent to 10 per cent shrinkage when finished normally, show shrinkages of 2 per cent or less when finished by this new process. After repeated washings these new fabrics show no further change in dimensions.

Sizing

While there has been a great deal of discussion concerning the application of the various cellulose solutions to the sizing of cotton and rayon warps for weaving, reports from various mills indicate that this work is still in the preliminary stage.

The results of considerable plant work in the application of the c.a.c. cellulose solutions to warp yarns for weaving do indicate that the practical possibilities are good and the difficulties so far have been in the mechanical application of the solution. Where mechanical application has been good, increased weaving efficiency and reduced shedding have been indicated.

Fabrics containing warp yarns properly sized with c.a.c. cellulose show improved tensile strength and abrasion resistance as well as a small net gain after Sanforizing. In addition, the fabrics show a fuller hand and a better affinity for dyestuffs.

Some of the most recent work on this problem suggests that there is a good possibility that the c.a.c. cellulose solutions may be applied on the usual slasher with only slight mechanical changes. If this work proves successful we may expect a wider acceptance of sizing with c.a.c. cellulose solutions.

Other Applications

The application of the c.a.c. solutions of cellulose to such fabrics as sheetings, damasks and collar linings are too well known to be described in detail. Many additional applications could be mentioned but such a listing would run into several pages. A number of specialized applications are being studied and continued investigation in both the laboratory and plant will bring forth numerous new applications of the versatile c.a.c. solutions of cellulose.

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Rat-Resistance—

(Continued from Page P135)

practically identical results. If a spatula or similar instrument is used to insert the strips vertically in the soil, care should be exercised to insure that the fold does not involve more than the low half inch of the strip. It is noted that where the fabric is folded over the spatula, more rapid deterioration usually develops; hence, the folded portion should be such that it will not be between the two sets of jaws and thus affect the breaking strength test. In vertical burials, at least 5 inches of the 6-inch specimens should be beneath the soil surface. Care should be taken that all parts of the specimen are in uniform contact with the soil, though too firm packing of soil should be avoided

as tending to retard microbial activity. When specimens are placed in position, a gentle tapping of the container is perhaps the best way to settle the soil about them.

If desired, specimens may be given a 24-hour water leaching treatment as described under II-B above, before the burial test. For this series of cooperative A.A.T.C.C. tests, leaching prior to burial is not recommended unless some laboratory desires to check the effect of leaching vs. no leaching, followed by soil burial.

The evaluation of proofing treatments by means of soil burial generally requires the removel of specimens at definite intervals for strength-loss determinations. For each of the coded A.A.T.C.C. samples, 1 series of 5 replicates is to be removed after 7 days' burial, a second set of 5 after 14 days, and the third set after 21 days. After removal from the soil the specimens are washed, dried, conditioned, and broken as described under II-A above.

The same soil may be re-used for repeated burials. Although observation indicates some acceleration of rotting with repeated use, it has not yet been determined how long it is safe to re-use the same soil. The use of treated and untreated controls is recommended to check such variables and aid in interpreting results. Prior to re-using the soil, it should be thoroughly stirred.

B. *Soil suspension.*

Culture medium: The culture medium shall have the following composition:

Ammonium nitrate	1.0 g.
Dipotassium acid phosphate	1.4 g.
Magnesium sulphate	0.7 g.
Calcium carbonate	0.005 g.
Sodium chloride	0.005 g.
Distilled water	1,000.0 ml.

Inoculum: Use composted soil made up as described for the soil burial test, under IV-A above.

Culture chamber, inoculation, and incubation: For the culture bottle, use a 16-ounce square bottle with modified screw cap. Place a strip of glass fabric, approximately ⅛ inch thick and cut 2 inches wide and 6 inches long, in the bottle in a convex position so that only the lengthwise edges touched the bottle and the center of the strip is approximately ½ inch from the bottle. If glass fabric is not available, agar may be used. The glass cloth serves as a support for the test fabric and as a wick to draw up the culture medium. Add sufficient culture medium to each bottle so that the glass wick will become thoroughly wet and there will be approximately 5 ml. of solution in excess. Care must be taken against using too much liquid medium or the test strip during incubation will become so wet that growth of the microorganisms will be inhibited.

Inoculate the fabric to be tested by immersing five test strips at a time for 30 minutes in a thin suspension of soil, containing 70 gm. of soil to 250 ml. of distilled water. Agitate the strips frequently during this time. Remove them from the soil suspension, place each strip on the glass wick in the culture bottle, and incubate at approximately 28° C. for 10 days. In inoculating additional strips prepare a fresh soil suspension. Remove the specimens, wash, and re-condition for breaking strength determinations. (See Dyestuff Reporter 32 (19): 395-398, September 13, 1943.)

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APPLICANTS FOR MEMBERSHIP

SENIOR

J. C. Whitt—Supt. of Dyeing, Morgan Cotton Mills, Laurinburg, N. C. Sponsors: C. B. Ordway, J. H. Orr.

JUNIOR

William B. Carney—Cotton Technologist, South. Reg. Research Lab., U. S. Dept. Agric., New Orleans, La. Sponsors: J. D. Dean, W. B. Strickland.

ASSOCIATE

Harry E. Johnson—Consulting Chemist, Lake Worth, Fla.

APPLICATIONS FOR TRANSFER TO SENIOR MEMBERSHIP

Clarence W. Bachman
W. Norbert Berard
Scott Brodie
Samuel C. Carpenter
Ruth Chartener
Clarence L. Cook
Henry X. de Redon
Robert H. Eckstine
Frederic L. Ekstrand
John A. Fanning
Dom Franceskетti
Robert F. Fritz
Charles Gardner
Nelson F. Getchell
George C. Graham, Jr.
Arthur C. Hayes
Theodore G. Hirsch
A. F. W. Jaeger
Harry B. Kime
William H. Kirkpatrick
Neil J. Manning
John M. McChesney
Francis E. Mosher
Edward L. Murphy
Hubert J. Murphy
George W. Murray
Walter H. Perry
John A. Rotatori
Clyde B. Rowntree
Ralph G. Schaubhut
Leo J. Sheehan
Mary P. Shelton
Thomas G. Sloan
James M. Smith
William S. Trezise
Boris Uzenoff
Henry Wiegand, 3rd
Burton C. Winkler

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MEETING, PHILADELPHIA SECTION

A MEETING of the Philadelphia Section was held on Friday evening, February 23rd, 1945, in the Mirror Room at the Hotel Philadelphian.

Arthur Etchells, chairman, introduced Dean Richard S. Cox of the Philadelphia Textile School, who asked all present to at least give an interview to any one calling on them asking for contributions for the school fund.

Arthur Etchells then introduced the main speaker of the evening, Dr. Harold Dewitt Smith, who gave his Marburg Lecture, "Textile Fibres—An Engineering Approach to an Understanding of Their Properties and Utilization." His talk was received with enthusiasm and given a rising vote of thanks.

There were 140 present for the meeting and 123 for the dinner.

Respectfully submitted,

A. E. RAIMO,
Secretary.

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OFFICERS' MEETING SOUTHEASTERN SECTION

THE officers and sectional committee of the Southeastern Section met in Atlanta, Ga., at the Ansley Hotel, on Saturday, Jan. 27, 1945, and thoroughly discussed plans for this year.

It was unanimously decided not to have the usual spring meeting this year because of the Government request that meetings of this type involving fifty or more people be cancelled. However, the officers and sectional committee plan to meet again in April, and if the congestion in both transportation and in feeding groups is not as bad at that time, and the O. D. T. will then sanction the meetings, it is planned to have one or more meetings this year if possible.

Participation in the Intersectional Paper Contest again this year was discussed and approved. The following committee was named to prepare the paper:

M. T. Barnhill, Chairman; R. O. Simmons, J. E. Smenner, L. E. Whittelsey and James C. Farrow.

To prevent future misunderstandings regarding methods of electing officers, and other angles concerning this section, the following committee was appointed to study the By-Laws adopted and in use in other sections, and prepare By-Laws for this section to be submitted to the membership for approval:

A. K. Haynes, Chairman, William R. Jones, R. O. Simmons, John C. Cook, J. W. Swiney and H. Gillespie Smith.

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ONE HUNDRED AND FORTY-EIGHTH COUNCIL MEETING

THE Council held its 148th meeting at the Downtown Athletic Club in New York City, on Friday morning, January 12, 1945. Present were President William D. Appel, presiding; Hugh Christison, Vice President; William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of

SECRETARY'S FINANCIAL REPORT—JANUARY 5, 1945

Received & transmitted to Treasurer	Applications	Dues, regular & reinstate.	Dues, Corporate & Sustaining	Miscellaneous	Totals
Aug. 1 to Oct. 5, 1944.....	445.00	134.50	2,925.00	397.56	3,902.06
Oct. 5, 1944 to Jan. 5, 1945.	1,142.50	12,079.00	17,444.48	5,101.76*	35,767.74
Total in fiscal year to date..	1,587.50	12,213.50	20,369.48	5,499.32	39,669.80
Leaving deposited by Treasurer with Secretary					2,000.00

Miscellaneous items,*		
Registration fees, Atlantic City		1,212.00
Dividend, 1st National Bank of Boston		40.00
Year Books		94.25
Reporters		63.00
Reprints		4.00
Crockmeters		303.68
Crock cloth		40.95
Multifiber cloth		2,769.00
Moth cloth		60.00
Water test apparatus		373.00
Dyed standards		33.00
Knitted tubing		91.00
Buttons		15.50
Standard gray cards		3.00
		5,102.38
Less bank charges		.62
		5,101.76

the Research Committee; William H. Cady, Carl Z. Draves and Thomas R. Smith, Past Presidents; Edward S. Chapin, Harry M. Hartnett and Charles H. A. Schmitt representing Northern New England; Howard V. King and Ben Verity representing Rhode Island; Kenneth H. Barnard, Roy G. Buck, Patrick J. Kennedy and Leonard S. Little representing New York; Henry B. Dixon and Samuel L. Hayes representing Piedmont; Miles A. Dahlen, Edwin I. Stearns, Harold B. Sturtevant, R. H. Souther, and Harold C. Chapin, Secretary.

From the tellers was accepted report of the election of William D. Appel, President; and Hugh Christison and Henry F. Herrmann, Vice Presidents. The Secretary's report of the 147th Council meeting and financial report of Jan. 5, and the Treasurer's report of Jan. 10, were accepted. Winn W. Chase was appointed Chairman of the Publicity Committee, and Samuel L. Hayes a member of the Corporate Membership Committee replacing Thomas R. Smith. Other appointed members of standing committees remained unchanged.

It was reported that the 1944 Year Book was mailed, and that work would begin at once on the 1945 book. It was voted, on recommendation of the Chairman of the Publications Committee, that Analytical Methods, omitted from the 1944 book to save paper, be printed in the 1945 book, and that the Dyestuff List be omitted. In consideration of an invitation from the Mid West Section, it was voted that there be no General Meeting in 1945, but that if conditions permit, there be a meeting in Chicago in 1946. It was voted that there be an Intersectional Contest in 1945, if possible in connection with a meeting of the New York Section in the fall, but otherwise by mail. Mr. Barnard was re-appointed Chairman of the Contest Committee.

Mr. Little reported for the Executive Committee on Research, and Dr. Stearns for the Association's representatives on the Inter-society Color Council. Dr. Dahlen reported on the Personnel Service instituted at the Atlantic City meeting. Forty-three employers had registered, many seeking several employees, but with little response from registrants seeking employment. The system worked out for arranging interviews, with printed forms and other details, would be useful at future meetings under normal conditions. It was voted that the service be repeated, and so far as possible made continuous through filing of employee qualification records with the Secretary at any time, and consultation of these records by employers in Lowell, or at local Section meetings. It was not recommended that records be mailed to employers, or that search be made by the Association for any employee to fit a specified position. Dr. Dahlen was thanked, and his recommendations approved. It was voted that the next Council meeting be in Providence on Friday, March 23.

Elected to Corporate membership were,
Aberfoyle Manufacturing Co.
Hans C. Bick, Inc.
Cluett Peabody Co.
Concord Knitting Co.
Cooper, Wells & Co.
Dundee Finishing Co.
A. Gross Co.
Hesslein & Co.
Hirsch-Werner, Inc.
Johnson City Mills
Judson Mills
Leatex Chemical Co.
Lee Dye Works
Marlowe-VanLoan Sales Co.
Martex Print Works
Otto B. May, Inc.
Ming Toy Dyeing Co.
Nebel Knitting Co.
Nolde and Horst Co.
Northern New England Section, A.A.T.C.C.
J. C. Penney Co.
Phoenix Hosiery Co.
Revolution Cotton Mills
Standard Chemical Products, Inc.
Straus and Eliasberg
Rafael Szmurak
Tryon Processing Co.
U. S. Testing Co.
Venango Engineering Co.
Verney Brunswick Mills
Warren Featherbone Co.
Wiscassett Mills, Knitting Dept.

Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary. (See table on next page.)

Respectfully submitted,
Harold C. Chapin, *Secretary.*

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ONE HUNDRED AND FORTY-FIRST MEETING OF THE RESEARCH COMMITTEE

THE 141st meeting of the Research Committee followed the Council meeting in New York on Friday afternoon, January 12, 1945. Present were Chairman Louis A. Olney presiding, H. C. Allen, W. D. Appel, A. G. Ashcroft, K. H. Barnard, J. R. Bonnar, W. H. Cady, E. S. Chapin, H. D. Clayton, J. B. Crowe, M. A. Dahlen, J. N. Dalton, C. W. Dorn, C. Z. Draves, H. Christison, S. M. Edelstein, H. Ehrhardt, H. E. Hager, H. M. Hartnett, S. L. Hayes, A. E. Hirst, W. A. Holst, N. A. Johnson, A. J. Kellner, H. V. King, D. P. Knowland, H. W. Leitch, L. S. Little, O. F. Marks, J. E. Meili, C. J. Monego, W. R. Moorhouse, A. D. Nute, W. F. Prien, F. A. Prisley, R. Robertson, B. A. Ryberg, C. H. A. Schmitt, C. A. Seibert, J. H. Shipp, G. B. Shoemaker, G. A. Slowinske, R. H. Souther, E. I. Stearns, J. A. Stevenson, H. W. Stiegler, H. B. Sturtevant, F. R. Tripp, L. H. Turl, B. Verity, and H. C. Chapin.

The Chairman reported publication of the 1944 Year Book, and plans for the 1945 book, to include Analytical Methods in place of the Dye List. Mr. Little reported for the Executive Committee on Research. Dr. Stearns presented a report from Dr. Godlove, Chairman of the Committee on Color. C. W. Dorn reported that the Committee on Wash Fastness Tests for Dyed or Printed Textiles had sent large samples to twenty-three commercial laundries, and expected them back for correlation with laboratory tests by the end of February. Eight sets of samples had gone to testing laboratories for launderometer tests and home laundering. The Rayon Group of the same committee, under A. R. Wachter, had fifteen fabrics under consideration for experimental tests, and H. B. Dixon's Hosiery Group was to have knitted sleeves ready for experiments in about three weeks.

The Committee on Detergency, just organized under F. A. Prisley, Chairman, had appointed C. L. Nutting Chairman of its group on wool, and V. B. Holland on cotton. Work had begun, at the Lowell

SENIOR

F. W. Adams	H. S. Dahlberg	S. J. Johnston	V. J. Mockus	H. Sentlar
D. F. Allen	M. M. Danley	R. M. Joslin	G. Moerkirk	J. Shower
C. N. Andersen	S. R. Detrick	A. H. Judge	C. G. Morton	J. C. Simkevich
T. H. Babb	W. B. Dewhirst	W. J. Kaderabeck	C. B. Moseley	F. D. Smith
L. Balassa	W. T. Donahue	W. P. Kampf	T. J. Motta	W. C. Snead
M. A. Bard	J. C. Doyle	E. M. Kelly	M. E. Mueller	N.Snyder
E. P. Bebeau	N. B. Edelman	H. J. Kenny	R. E. Nelson	M. J. Sostmann
A. A. Beckwith	R. M. England	J. P. Kershaw	H. J. Nichols	A. Spalding
A. Berlings	A. Esposito	T. S. Kidd	D. M. Norket	K. H. Stamm
R. T. Berry	R. Evans, 2nd	W. Klaas	A. Northrup	H. E. Stanley, Jr.
G. T. Binner	J. F. Fairman	H. Klein	J. J. O'Day	G. E. Stevenson
D. A. Bishop	R. W. Farrow	C. L. Kloss	J. W. Ogletree	H. D. Terhune
C. E. Bloom	C. N. Fitz	F. H. Kranz	E. D. Ottinger	W. J. Thackston, Jr.
E. F. Bohl	L. A. Fluck, Jr.	O. R. Krasley	A. M. Owens	J. A. Thomas
J. W. Bordner	R. A. Franz	G. T. Kreis	D. H. Patterson	W. J. Thorn
R. Born	H. J. Friedrichs	R. J. Kroener	H. V. Petelle	H. M. Thorpe
E. M. Bradley	S. Garfinkel	I. Kuchinsky	R. R. Pezet	L. H. Turl
W. J. Brink	C. G. Genest	G. M. LaBerge	O. Pfeifer	R. Van Hoff
R. F. Brown	S. J. Golub	W. W. Larkin	A. G. Pope	J. Wallace
D. W. Buehler	D. Grant	M. J. Liberty	C. E. Post	M. N. Wattis
H. W. Buisson	R. M. Guckes	A. Lifland	M. J. Reider	C. L. Webb
D. Burks, Jr.	O. B. Hager	E. B. O. Lindquist, Jr.	E. J. Remaley	R. R. Weber
L. H. Burt	O. Hagist	J. Lindsay, Jr.	E. O. O. Riebe	H. T. Weinmann
A. R. Cade	J. E. Hardman	C. E. Lloyd	E. H. Robinson	B. L. West
H. R. Calvert	F. L. Hilbert	W. S. Lowery	F. R. Rody	E. L. Whitford
R. L. Carr	E. F. Hill	F. W. Lubas	T. G. Roehner	W. P. Whitlock, 3rd
W. R. Castle	S. S. Horowitz	J. E. Lynn	E. R. Roper	J. C. Whitt
J. E. Charves	E. E. House	H. M. Manchester, Jr.	M. C. Roth	J. B. Williams
R. C. Childs	C. M. Hunt	I. W. Maher	K. C. Ruppenthal	M. S. Williams, Jr.
W. Collie	R. P. Ingram	P. A. Mazur	J. B. Rust	E. L. Wingo
J. W. Conklin	H. R. Ivey	C. H. McCandless	F. J. Rutzen	E. A. Wolff
K. W. Coons	T. F. Jacoby	W. L. McGhee	V. L. Sarrailh	S. B. Wood
J. Coupe	H. J. Jayr	A. Metelka	L. E. Schall	T. J. Wrocklage
R. T. Cowing	D. L. Johnson	W. W. Meyer	J. C. Schmidt	J. Zender
W. P. Culpepper	W. S. Johnson	W. W. K. Miller	M. Schneider	F. Zimmerman
W. M. J. Custer	A. O. Joslin		E. A. Shuman	G. Zinzalian

JUNIOR

W. B. Carney	J. J. Gordon	G. A. Lathrop	D. S. Lyle	F. K. Ray
J. Epelberg	J. M. Gould	M. I. Leavitt	G. Marti	R. G. Stevens
M. Erban	P. E. Keeney		H. E. Meunier	E. J. Troianello

ASSOCIATE

T. H. Baylis	R. Dane	G. A. Goulston	D. R. Koya	T. J. Rasmussen
S. Besthoff	W. T. Eveleth	K. W. Hartmann	J. K. Martell	C. G. Schultze
L. A. Blaisdell	G. A. Farley	W. S. Howard	W. L. Parrott	A. C. Shuman
J. Carmony	M. I. Feuerstein	H. E. Johnson	W. H. Randolph, Jr.	G. R. Tjaden
J. B. Cleaveland	F. J. Gerish			W. B. Warren

STUDENT

T. S. Ciftci	I. R. Hodara	H. T. Liu	T. C. Lu	S. Milgrim
I. A. Frish	M. Kibrick	M. R. Llaguno	N. W. Mandel	A. Nelbandian

Each of the following was transferred from other classifications to Senior membership—

C. W. Bachman	R. H. Eckstine	G. C. Graham, Jr.	F. E. Mosher	R. G. Schaubhut
W. N. Berard	F. L. Ekstrand	A. C. Hayes	E. L. Murphy	L. J. Sheehan
S. Brodie	J. A. Fanning	T. G. Hirsch	H. J. Murphy	M. P. Shelton
S. C. Carpenter	D. Franceskетti	A. F. W. Jaeger	G. W. Murray	T. G. Sloan
R. Chartener	R. F. Fritz	H. B. Kime	W. H. Perry	J. M. Smith
C. L. Cook	C. Gardner	W. H. Kirkpatrick	J. A. Rotatori	B. Uzenoff
H. X. de Redon	N. F. Getchell	J. M. McChesney	C. B. Rowntree	H. Wiegand, 3rd
				B. C. Winkler

Textile Institute, on a laboratory washer similar in principle to a dolly washer.

D. P. Knowland reported for the Committee on Transference of Color, showing a color card which had been suggested for standards. It seemed the consensus of opinion, however, that grays are preferable. W. C. Durfee was made a member of this committee.

K. H. Barnard reported for the Committee on Ageing of Textiles, concerned primarily with atmospheric influences themselves, apart from biological action. A. J. Kellner reported for the committee of the Association cooperating with committees of the American Society for Testing Materials and the National Association of Insecticide and Disinfectant Manufacturers on tests for resistance to insect pests. Experiments were under way with five months old carpet beetles, but further work was contemplated with the whole life cycle of six months.

The Association's spray test for water resistance was reported by G. A. Slowinske adopted as a standard by the British Textile Institute. The present hydrostatic pressure test was voted an official standard of our Association. Comparative tests of this and the Suter tester had been completed in Lowell and results were ready for publication. The impact penetration test, simulating rain as described in the REPORTER of February 15, 1943, was voted a tentative standard. It was emphasized that these tests are for study of fabrics rather than for evaluation of garments made from them.

Respectfully submitted,

HAROLD C. CHAPIN,
Secretary.

TRADE NOTES • NEW PRODUCTS

• DYEING AND PRINTING FIBERGLAS

"Dyeing and Printing Fiberglas" is the title of No. 1 of a series of booklets on Aridye Pigment Colors for the Fabrics of Tomorrow. This booklet, which has been issued recently by Aridye Corporation, Fair Lawn, N. J., describes the methods which have been developed for applying resin-bonded pigment dyes to Fiberglas fabrics to be used for draperies and other decorative purposes.

• ACQUIRE STONEHAM PLANT

George Mann & Co., Inc., of Providence, R. I., well known New England heavy chemical merchants, announce the acquisition of the plant and property of the Hercules Powder Company at Stoneham, Mass.

Complete stocks of heavy chemicals will be maintained and distributed from this new plant, in addition to their service from Providence. Sales will be under the direction of Donald C. Knapp, who has been associated with the company for 20 years. It was expected that the present Boston office of George Mann & Co., Inc., would be moved to the Stoneham plant about January 1, 1945.

• HERCULES SUBSIDIARY

Hercules Powder Company announced recently that it is creating a subsidiary, Hercules Powder Company, Ltd., for the distribution of technical information on its chemical products in Great Britain and Eire.

The company, which will have offices at 140 Park Lane, London, will be under the direction of Cornelius H. B. Rutteman, managing director.

Directors are Thomas H. Cooke, manager of Holden Vale Manufacturing Company, Haslingden, Lancashire, a partly owned subsidiary of Hercules; R. H. Oxley, manager of the London branch of the Bankers Trust Company of New York; Kenneth D. Cole, a member of the firm of Messrs. Linklaters & Paines, solicitors; and Cornelius H. B. Rutteman.

Hercules has been selling chemicals in Great Britain for 25 years, and throughout the period its technical representatives have been assisting distributors and customers in the utilization of these chemicals. Mr. Rutteman has been the company's resident representative in London since 1939.

The London office will administer the company's English business and assist customers and local distributors with data and technical service on the use of Hercules products. These include cellulose derivatives for lacquers and plastics, terpene and rosin chemicals, synthetic resins for the protective coating and other industries, and paper makers' chemicals.

Manufacturing operations of the Hercules Paper Makers Chemical Department will be continued at Erith, England.

• SPOKE TO BACTERIOLOGISTS

Louis C. Barail, M.D., Chief Bacteriologist of the U. S. Testing Company presented a paper at the meeting of the New York Section of the American Society of Bacteriologists held on March 13th at Teachers' College Hall, Columbia University. The paper was entitled "Antiseptic Fabrics."

Dr. Louis C. Barail is president of the American Society of Biophysics and Cosmobiology.

• RETURNS TO SYLVANIA

John Adrian, who has been with the Chemicals Bureau of the War Production Board in Washington for the past eighteen months, has returned to the Sylvania Industrial Corporation. Mr. Adrian will make his headquarters at the New York office of the company as special representative.

• RESEARCH UNIT, NAVAL CLOTHING DEPOT

The Navy Supply Corps has established a research unit at the Naval Clothing Depot, 29th Street and 3rd Avenue, Brooklyn 32, New York. Captain Charles D. Kirk, U.S.N., is the Supply Officer in Command of the activity.

The newly created department which is now functioning will conduct all research and development of the Navy's clothing and small stores, textiles, shoes and their containers.

In addition to testing and improving presently used textiles and conducting research and study of new products, the department will prepare specifications and investigate and correct difficulties encountered with existing materials and test methods. The division is under the supervision of Lieut. John L. Fawcett, U.S.N.R., and is staffed by trained civilian technicians and naval officers. Prior to his entrance into the Navy, Lieutenant Fawcett, a consulting textile specialist, was an instructor in textiles at the New Bedford Textile School, Massachusetts.

• AMERICAN VISCOSE SCHOLARSHIP

A competitive scholarship award of $1,200, the winner receiving $300 for each session of his four-year course of study, has been established at Roanoke College, Roanoke, Va., by the American Viscose Corporation.

Commenting on the scholarship, Dr. Charles J. Smith, Roanoke College president, said: "While the company intends to inaugurate this award with the class entering next September, it has at the same time made available a scholarship of $300 for the present session of 1944-45 to men students already enrolled in the college."

Holders of these scholarships will be offered employment with the American Viscose Corporation's Roanoke plant at the end of their college course in such fields as their training warrants. They will be under no obligation, however, to accept employment with the company if their desires should lead them in another direction.

• LANASET TREATED WOOL SHIRT

Dr. Roy Chapman Andrews (right), noted author and explorer, studying with George J. Stobie, Maine Fish and Game Commissioner, the first wool sports shirt for consumer use that has been treated with American Cyanamid Company's melamine resin, Lanaset, which, it is stated, controls the shrinkage of wool and permits the repeated laundering of wool garments. The sports shirt, the first of its kind, was made by the Le Roy Shirt Company and was presented to Commissioner Stobie by Dr. Andrews at the recent National Sportsman's Show, Madison Square Garden, New York.

• APPOINTED VICE PRESIDENT

Edwin A. Russell, Director and Sales Manager of the Philadelphia Quartz Company, Philadelphia, has been named Vice President in Charge of Sales. Mr. Russell joined the Company in 1918, was ap-

• MOUNT HOPE EXPANDER

This expander, recently announced by Mount Hope Machinery Co. of Taunton, Mass., is said to meet the long felt need for a device which will produce maximum width with minimum warp tension (and without undue wear on the surface of the expander) in the finishing or coating of fabrics. It is claimed that a single expander located in front of the nips of mangles, calendars or washers, etc. will positively protect the cloth from creases being squeezed into it. A special expander has proven most effective for rolling up rayon or cotton tire cord without wrinkles.

The roll is Neoprene covered and ball bearing mounted. It is sated that it is so free turning that the unit can be used for expanding rayon marquisette without putting too much tension on the warp; and as many as 6 of them at one time have been used on cotton marquisette in front of a stack of dry cans, thus producing exceptional crosswise stretch.

The minimum tension on the warp is said to greatly reduce the tendency of the cloth to contract in width and also increase the life of the rubber surface, because less drag is required to turn the expander.

The manufacturer plans to carry 50" expanders in stock.

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pointed Assistant Sales Manager in January 1921, and Sales Manager in January 1928. He now has full administration of the Company's domestic sales. In addition, he is Director and Sales Manager of an associated company, the American Doucil Company, manufacturers of synthetic zeolites.

J. Passmore Elkinton, Vice President and Director, continues in charge of foreign sales for the Quartz Company.

The Company also announced the appointment of George J. Banse as Assistant Treasurer and Assistant Secretary.

• TEXTILE RESEARCH JOURNAL

Textile Research, published by Textile Research Institute, Inc., 10 East 40th Street, New York, has been enlarged, and revised, and made a scientific and technical journal devoted to the interests of textile research. This publication, now in its fifteenth volume, will henceforth be known as *Textile Research Journal*. It will cover the field of the sciences and engineering as related to the structure and properties of textiles, textile fibers, and textile raw materials, and to the processes involved in textile manufacture.

• CHICAGO PLANT, NUODEX

Acquisition of a plant and railroad siding at 19th Street and So. Washtenaw Avenue, Chicago, Illinois, by Nuodex Products Co., Inc., chemical manufacturers of Elizabeth, New Jersey, was made public recently by Walter Gotham, Vice President in charge of production.

It is expected the plant will be put in operation within the next few months depending on the availability of the necessary equipment. When improved it will add some 40,000 square footage of floor space to the steadily expanding Nuodex interests who now have plants in Toronto, Canada and Sydney, Australia in addition to the parent plant in Elizabeth, New Jersey.

• MIDWESTERN MANAGER, NATIONAL STARCH

National Starch Products Inc. announce the appointment of Donald D. Pascal to the managership of their Mid-Western Division with headquarters at Washtenaw Ave. and 36 Place, Chicago, Illinois.

Mr. Pascal, as is known by his many friends in the trade, joined the original National Adhesives organization 15 years ago . . . advancing through the Laboratory and Service Departments to become, in turn, Manager of the Philadelphia branch, Director of Technical Service, and more recently, technical assistant to Chester A. Gage, Vice-President in Charge of Sales.

• RESEARCH PROGRAM, R. & D. R.

New textile dyeing processes, and recent developments in the use of synthetic resins and other bonding agents in the treatment of yarns and fabrics, have been announced by the research division of Riverside and Dan River Cotton Mills, Inc., following the annual meeting of stockholders.

Also made public at the same time was a brief review of the work of the research division and a detailed digest of the textile patents now held by the company, and of a number of applications for patents now pending. The commercial applications of these new processes are described in some detail.

Several of the new processes are in regular production, particularly a process for rapid and continuous vat dyeing by which more than 100,000,000 yards of cloth have already been dyed, much of it to rigid Government specifications.

A method of "union dyeing" that permits the simultaneous and uniform dyeing of acetate and cellulose rayon mixtures was announced as a development of particular interest and importance.

Another dyeing method which yields fast colors and resin protective treatments in the same operation, is referred to as the basic process and the first in conception and development in the comparatively new art of pigment dyeing.

This review of Dan River research reveals that these developments in textile manufacturing are the direct results of a planned program of research carried out in a series of fully equipped laboratories, and directed by a staff of chemists and physicists especially trained in scientific textile practice.

OBITUARY

EMIL CARL LESSER

EMIL CARL LESSER of 550 Riverside Drive, New York City, retired chief chemist of the American Dyewood Company, died on March 6th in the Park East Hospital at the age of 83.

Born in Germany, Dr. Lesser was graduated from the University of Berlin and came to the United States in 1893. His first employment was as purchasing agent and chemist at the Merrimack Print Works. He also taught evening classes at the Lowell Textile Institute. About 1902 he joined the American Dyewood Company at its Boston office as a demonstrator and chemist. He was later transferred to the New York office and then to the Chester, Pa., factory.

In 1910 and 1911 Dr. Lesser did further research work at the Massachusetts Institute of Technology, where he developed a process for the manufacture of synthetic dyes from the coloring principle of logwood (hematoxylin). He also did considerable work having to do with investigation of the best type or specie of logwood to yield the greatest weight-giving properties when used on tin-weighted silk. On numerous occasions he demonstrated the use of the natural dyewoods in the coloring of cotton piece goods in a continuous dyeing method.

Dr. Lesser retired from the American Dyewood Company about 10 years ago. He was a member of the American Association of Textile Chemists and Colorists.

He is survived by his widow and a daughter.